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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 11, NUMBER 18
SEPTEMBER 15, 1978

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 11, NUMBER 18
SEPTEMBER 15, 1978

W78-08201 -- W78-08800

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

CONTENTS

FOREWORD iii

SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA
Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS
Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES
Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION
Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

2. WATER CYCLE

2A. General

THE STABILITY OF PARAMETER ESTIMATION IN THE GENERAL LINEAR MODEL,
Ireland Office of Public Works, Dublin.
T. Bree.
Journal of Hydrology, Vol. 37, No. 1/2, p 47-66, April 1978. 4 fig, 4 tab, 11 ref.

Descriptors: *Runoff, *Water storage, *Hydrographs, *Model studies, Mathematical models, Precipitation(Atmospheric), Rainfall, Unit hydrographs, Storage, Rainfall-runoff relationships, Equations, Estimating equations, Rivers, Streamflow, Storms, Floods, Hydrologic cycle, Hydrology.

The identification of system parameters in the general or multi-parametric linear model can give rise to serious difficulties, particularly when only a small amount of data is available. The problem is centered on the degree of collinearity in the input to the system. A high degree of collinearity causes ill-conditioning, and small errors in the input-output data result in severe oscillations in the derived kernel function. This effect was examined by analyzing the system both in the time domain and in the transform domain, and in each case an index was derived which measures the degree of collinearity present. The stochastic linear model was fitted to the relationship between effective rainfall and direct surface runoff by the direct algebraic method in which the objective function is the sum of squared deviations between the observed and predicted runoff, and the statistical properties of this estimator were described. In a numerical example, the optimal unit hydrograph was derived by combining the data from a number of independent flood events. The addition of further rainfall-runoff data into the joint estimation procedure greatly reduces the degree of collinearity. The model was extended to allow for an observed correlation in the random disturbances of the system, and the parameter estimates were validated using an additional flood event. (Sims-ISWS)
W78-08282

SIMULATION OF THE HYDROLOGIC CYCLE USING ATMOSPHERIC WATER VAPOR TRANSPORT DATA,
Research Inst. for Water Resources Development, Budapest (Hungary).
P. Magyar, A. N. Shahane, D. L. Thomas, and P. Bock.
Journal of Hydrology, Vol. 37, No. 1/2, p 111-128, April 1978. 7 fig, 6 tab, 16 ref.

Descriptors: *Hydologic cycle, *Synthetic hydrology, *Meteorological data, *Model studies, Mathematical models, *Water vapor, Atmosphere, Precipitation(Atmospheric), Runoff, Evapotranspiration, Watersheds(Basins), Drainage, Hydrology, Meteorology, Water vapor transport.

To extract useful hydrologic information from existing meteorological observations, a recently developed simulation procedure for four experimental drainage basins (size ranging from 51,800 to 151,028 sq km) of the US was described. In addition to generating and verifying the mean monthyl hydrometeorological time series for a 5-year period, an attempt was made to extend mean monthly hydrometeorological components for a period of 26 years using a longer span of the available historical precipitation and runoff time series. The final outcome of the computerized simulation program provides the extreme values (with five selected return periods) for two atmospheric components (precipitation, runoff, evapotranspiration, and change in terrestrial storage). These maximum and minimum values are expected to be useful in developing various criteria while planning the large-scale water resource projects on flood routing, land drainage, irrigation, erosion protection, navigation, water power utilization, and water supply. (Sims-ISWS)
W78-08285

SENSIBILITY OF PARAMETERS OF THE SSARR MODEL (SENSIBILITE DES PARAMETRES DU MODELE SSARR),
Hydro-Quebec, Montreal. Service Hydraulique.
N. Kang.
Journal of Hydraulic Research, Vol. 16, No. 1, p 1-25, 1978. 20 fig, 20 tab, 12 ref.

Descriptors: *Watersheds(Basins), *Model studies, *Runoff, *Computer models, Rainfall-runoff relationships, Hydrology, Precipitation(Atmospheric), Evaporation, Infiltration, Hydrographs, Soil moisture, Reservoirs, Analytical techniques, Foreign research, SSARR model, Model parameters.

The most powerful use of the SSARR model is in its flexibility, which permits the user to model hydrologically any watershed. However, hydrologic experience and familiarity with the program are needed for the successful use of this model. The great flexibility of the model comes from the watershed parameters (16) introduced in the model. The present studies gave a basis understanding of these parameters and their effects on the streamflow computation. An attempt was made to quantify these effects in giving in per cent the variations of discharge, runoff volume, etc., in relation to the variations of each parameter. Results of these studies could be used by anyone who applies the SSARR program to model any particular watershed. (Humphreys-ISWS)
W78-08293

UNDERGROUND RESERVOIRS TO CONTROL THE WATER CYCLE,
Food and Agriculture Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 4B.
W78-08297

COMPUTATION OF THE RAIN RUNOFF OF UNSTUDIED RIVERS IN THE USSR,
For primary bibliographic entry see Field 4A.
W78-08575

2B. Precipitation

CALIFORNIA DROUGHT OF 1976 AND 1977: EXTENT, DAMAGE, AND GOVERNMENTAL RESPONSE.
Comptroller General of the United States, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-08225

WEATHER AND WATER.
World Meteorological Organization, Geneva (Switzerland).
Available from the National Technical Information Service, Springfield, VA 22161 as N77 25740 H2/E, Price codes: A03 in paper copy, A01 in microfiche. Report WMO-No. 463, 1977. 25 p, 13 fig.

Descriptors: *Meteorology, *Hydrology, *Weather, *Precipitation(Atmospheric), *Forecasting, *Water loss, *Water supply, Irrigation, Land use, Climates, Dams, Flood control, Climatology, *Hydrological forecasting, *Climatic change, Dam flooding.

The complex interdependence of meteorology and hydrology are documented from a non-technical viewpoint. Topics addressed include: hydrological forecasting, weather and water data for designing hydraulic structures, dam flooding, water loss avoidance, effect of land use on water supply, irrigation, winds, climatic change, the role of the World Meteorological Organization (WMO) in water resources development, WMO projects in developing countries in Africa, Asia, and South America, and WMO activities in hydrology and water resources development. (Seip-IPA)
W78-08245

THE PREDICTION OF SHORT-DURATION STORM RAINFALL INTENSITY MAXIMA,
Saint David's Univ. Coll., Lampeter (Wales). Dept. of Geography.
G. N. Sumner.
Journal of Hydrology, Vol. 37, No. 1/2, p 91-100, April 1978. 3 fig, 3 tab, 4 ref.

Descriptors: *Rainfall intensity, *Storms, *Rainfall, Model studies, Mathematical models, Equations, Data processing, Analytical techniques, Forecasting, Statistics, Correlation analysis, Weather, Meteorology, Short-duration rainfall, Intensity maxima.

The acquisition of rainfall intensity maxima data over very short durations (generaly less than 15 min) for individual rainstorms remains a problem. Autograhic gauges of a desirable accuracy are rarely available at low cost, and other forms of measurement such as radar, also depend heavily upon intensive capital investment. Certan within-storm maximum intensity relationships, however, can be exploited to permit the estimation of shorter-period from longer-period values, where the instrumental base is poor or sparse. Statistically significant relationships emerge between short and longer duration maxima over a number of rain events at a site. The significance of these relationships increases as the durations correlated approach one another, due to interdependence of data. More usefully, however, curves of the form I sub t = kt to the (-n) power, generally applied to intensity maxima over periods of the order of decades, can be equally well-fitted to observed intensity maxima over different durations in the same rain event. Examples of convectional storms and frontal disturbances were given, and in each case the goodness of fit was excellent. (Sims-ISWS)
W78-08283

SIMULATION OF THE HYDROLOGIC CYCLE USING ATMOSPHERIC WATER VAPOR TRANSPORT DATA,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 2A.
W78-08285

RAINFALL ANALYSIS FOR THE DESIGN OF STORM SEWERS IN BOMBAY,
Associated Industrial Consultants, Bombay (India).
S. D. Chawathe, U. R. Shinde, S. S. Fadanvis, and V. V. Goel.
Journal of the Institution of Engineers (India), Vol 58, Part EN1, p 14-20, October, 1977. 1 fig, 9 tab, 5 ref.

Descriptors: *Rainfall, *Runoff, *Storm water, *Storm drains, Analytical techniques, Mathematical studies, Data collection, Computer programs, Urban runoff, *Rainfall intensity, Sewerage, Municipal wastes.

Rainfall intensity, duration, and frequency relationships were examined for two sections of Bombay, India, over 24-33 yrs as a preliminary to designing and upgrading storm sewers. Rainfall data over 24 yrs in Colaba represented 1,349 storms; 33 yrs of rainfall records for Santa Cruz

encompassed 2,708 storms. A rational method of storm sewer system design was used in conjunction with the least squares method of rainfall analysis to calculate the design discharge from the product of the runoff coefficient, the area serviced by the designed storm sewer, and the storm intensity over a specific duration and frequency. Rainfall intensity was derived as a function of storm duration and storm frequency. A computer program was developed to correlate data on storm frequencies of various durations and intensities with intensity-duration-frequency relationships for specific storm frequencies. The relationships were then used to estimate runoff in storm sewers by the rational formula. Calculated rainfall and runoff data were in close agreement with observed values. The information from the study was to be used in designing storm water sewers for the city of Bombay. (Lisk-FIRL)
W78-08433

IMPACT OF RAINFALL ENHANCEMENT ON HYDROLOGY,
Kansas State Univ., Manhattan. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3B.
W78-08570

SOUTHERN ARIZONA FLOODS OF OCTOBER 6-11, 1977,
Weather Service Forecast Office, Phoenix, AZ.
For primary bibliographic entry see Field 2E.
W78-08577

A DEVICE TO EXCLUDE DUST FROM RAIN-WATER SAMPLES,
Nature Conservancy, Grange-over-Sands (England). Merlewood Research Station.
D. G. Benham, and K. Mellanby.
Weather, Vol. 33, No. 4, p 151-154, April 1978. 2 fig, 4 ref.

Descriptors: *Instrumentation, *Sampling, *Rain water, *Rain gages, Patents, Equipment, Precipitation gages, Gages, Water sampling, Electronics, Automatic control, Automation.

The device described appears to act rapidly, is relatively inexpensive and simple to produce, and, as it is battery operated, can be used at sites remote from electric power supplies. It is based on the principle that the continuous impact of rain drops falling on the sensing area removes a protective cover from the rain gauge. Dust, falling leaves, wind, and other extraneous vibrations and sounds do not activate the cover. The device can be set specifically to discriminate between various forms of precipitation, e.g., drizzle, hail, heavy rain. The device was shown diagrammatically and the electronic circuitry was indicated. The main sensor consists of a thin aluminum plate which acts both as a sounding board and a cover for the rain gauge. The plate is connected to a microphone, being mounted so that the vibrations or impulses are transmitted to it. The microphone activates a small direct current motor. The apparatus will operate continuously for several months using two 9-volt dry batteries. The electronic circuitry can be used to filter the signal and to discriminate between the types of signal produced so that only the desired form of signal removes the cover. This device was awarded a provisional patent No. 32032 on 29 July 1977. (Humphreys-ISWS)
W78-08578

2C. Snow, Ice, and Frost

SNOWMAPPING IN SOUTHERN NORWAY BY USE OF LANDSAT IMAGERY,
Norsk Inst. for Vannforskning, Blindern.
J. Skorve.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-33572, Price codes: A03 in paper copy, A01 in microfiche. Report NASA CR 155031, May 25, 1977. 25 p, 21 fig, 2 tab.

Descriptors: *Snow survey, *Norway, *Snow cover, *Remote sensing, Satellites(Artificial), Snowmelt, Mapping, Precipitation(Atmospheric), *Snowmapping, *LANDSAT, *Areal hydrology.

LANDSAT remote sensing techniques were used to study the snowcover in four mountainous basins in southern Norway which represent four different climatological conditions. Data from 1975 and 1976 enabled the observation of one complete melting season; observations cover the period of mid-May to the end of August 1975. Subsequent runoff information is compared with the rate of decrease in areal extent of the snow cover in each basin. LANDSAT imagery is well-suited for snowmapping in mountainous Norway. There is an obvious correlation between the areal extent of snow cover and the amount of water stored in the basins as snow. LANDSAT images and data are presented. (Seip-IPA)
W78-08238

MEASUREMENTS OF THE ENERGY FLUXES INVOLVED IN THE ENERGY BUDGET OF A SNOW COVER,
Atmospheric Environment Service, Downsview (Ontario).
D. C. McKay, and G. W. Thurtell.
Journal of Applied Meteorology, Vol 17, No 3, p 339-349, March 1978. 3 fig, 2 tab, 22 ref.

Descriptors: *Snow cover, *Energy budget, *On-site investigations, Energy, Snow, Measurement, Data processing, Meteorological data, Temperature, Air temperature, Winds, Radiation, Solar radiation, Humidity, Heat transfer, Energy fluxes.

Measurements of the various energy components involved in an energy balance of a snow cover were made at the Elora Research Station, University of Guelph, during the winter of 1976. A pressure sphere anemometer and a sonic anemometer-thermometer, in conjunction with fast response, fine wire, resistance thermometers and Lyman-alpha humidiometers, were used to measure the fluxes of sensible and latent heat by eddy correlation techniques. A net radiometer and soil heat flux plates measured the radiative and soil heat fluxes. The data allowed a complete energy budget to be calculated, including the energy stored in the snowpack and/or utilized in the fusion process, determined as a residual. The data indicated the absence of any close relationship between the net radiation and sensible and latent heat fluxes during the diurnal cycle. The flux of heat into the snowpack was found to be a major component of the energy balance. Maximum evaporation from the snow to be a major component of the energy balance. Maximum evaporation from the snow surface was observed to occur following the replacement of warm moist air masses by cold dry air masses. During these periods the sensible and latent heat fluxes were greater than the net radiation and resulted in a rapid loss of energy from the snowpack. The determination of evaporation from the snowpack using a Bowen ratio energy balance approach was found to be impractical because the large energy flux into the snowpack could not be determined independently with sufficient accuracy. (Sims-ISWS)
W78-08272

WATER YIELD OF LOW-ALPINE SNOW TUSSOCK GRASSLAND IN CENTRAL OTAGO,
Otago Univ., Dunedin (New Zealand). Dept. of Botany.
For primary bibliographic entry see Field 2G.
W78-08277

PAST GLACIAL ACTIVITY IN THE CANADIAN HIGH ARCTIC,
Alberta Univ., Edmonton. Dept. of Geography.
J. England, and R. S. Bradley.
Science, Vol 200, No 4330, p 265-270, April 21, 1978. 2 fig, 41 ref.

Descriptors: *Arctic Ocean, *Glaciology, *Arctic, *Geomorphology, Ice, On-site investigations, Glacial drift, History, Geologic history, Evaluation, Analysis, *Greenland, *Ellesmere Island, Ice sheet.

Field observations on northeast Ellesmere Island indicated that the maximum advance of the northwest Greenland Ice Sheet was about 100 km beyond its present margin. This occurred before the outermost Ellesmere Island ice advance, which took place more than 30,000 years before present (B.P.), Recession from the Ellesmere Island ice margin began at least 28,000 to 30,000 and possibly more than 35,000 years B.P. During this sequence of glacial events, significant land areas remained free of ice. The late Wisconsin ice extent along both northeast Ellesmere Island and northwest Greenland was extremely limited, leaving an ice-free corridor along Kennedy and Robeson channels. Recession from these ice margins is indicated by initial postglacial emergence around 8100 to 8400 years B.P. The relatively minor extent of late Wisconsin ice in the High Arctic probably reflects a period of extreme aridity occasioned by the buildup of the Laurentide Ice Sheet to the south. (Humphreys-ISWS)
W78-08279

WATER MOVEMENT IN POROUS MEDIA TOWARDS AN ICE FRONT,
Technische Hogschool, Eindhoven (Netherlands). Dept. of Technical Physics.
M. B. G. M. Biermans, K. M. Dkjkema, and D. A. De Vries.
Journal of Hydrology, Vol. 37, No. 1/2, p 137-148, April 1978. 9 fig, 3 tab, 11 ref.

Descriptors: *Soil water movement, *Frozen ground, *Freezing, *Laboratory tests, Ice, Ice-water interfaces, Porous media, Temperature, Water temperature, Pressure, Frost heaving, Frost action, Soils, Soil water, Physics, Soil science, *Ice fronts.

The influence of pressure on water flow towards an ice front, located above a glass filter, was investigated experimentally at temperatures in the range from 0 to -0.05C. At constant temperature, pressures of the ice and the water were controlled independently. The former was kept at 1 atm., while the latter was lowered stepwise between 1 and 0.2 atm. At a given temperature, equilibrium was observed at a pressure difference between ice and water that can be found from a Kelvin-type equation. At a smaller pressure difference, water flowed towards the ice, while ice accretion and frost heaving occurred. At a larger pressure difference, melting of the ice and water flow away from the ice front were observed. A simplified description was given of the phenomena occurring in the interfacial layer of water between the ice and the glass filter. (Sims-ISWS)
W78-08287

PROBLEMS OF THE THEORY OF FLASH FLOOD FORMATION IN THE RIVERS OF THE PERMAFROST ZONE,
For primary bibliographic entry see Field 2E.
W78-08576

2D. Evaporation and Transpiration

MEASUREMENTS OF THE ENERGY FLUXES INVOLVED IN THE ENERGY BUDGET OF A SNOW COVER,
Atmospheric Environment Service, Downsview (Ontario).

For primary bibliographic entry see Field 2C.
W78-08272

EFFICIENT PREDICTION OF GROUND SURFACE TEMPERATURE AND MOISTURE, WITH INCLUSION OF A LAYER OF VEGETATION,
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 2G.
W78-08275

EVAPORATION FROM HORIZONTAL SOIL COLUMNS WITH VARIABLE DIFFUSIVITY,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering.
P. Basak.
Journal of Hydrology, Vol. 37, No. 1/2, p 129-136, April 1978. 3 fig, 7 ref, 1 append.

Descriptors: *Evaporation, *Diffusivity, *Soil moisture, *Model studies, Mathematical models, Moisture content, Equations, Mathematics, Soil water, Soil water movement, Porous media, Soils, Hydraulic conductivity, Analytical techniques.

Presented herein was an analytical solution to the problem of evaporation from horizontal soil columns in which diffusivity increases linearly with moisture content. The exact solution of the nonlinear governing differential equation was compared with the solution of the linearised governing differential equation. The solution of the problem with variable diffusivity in relation to the constant diffusivity case was discussed. The analysis showed that the existing solution for constant diffusivity is a special case of the solution for variable diffusivity presented in this paper. (Sims-ISWS)
W78-08286

SOIL MOISTURE EFFECTS ON TRANSPIRATION AND NET CARBON DIOXIDE EXCHANGE OF SORGHUM,
Kansas State Univ., Manhattan. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W78-08362

DIURNAL ALBEDO VARIATION OF BLACK SPRUCE AND SPHAGNUM-SEDGE BOGS,
Oregon State Univ. Extension Service, Corvallis.
E. R. Berglund, and A. C. Mace, Jr.
Canadian Journal of Forest Research, Vol. 6, No. 3, p 247-252, September 1976. 2 fig, 2 tab, 16 ref.

Descriptors: *Fluctuation, *Bogs, *Albedo, Wetlands, Seasonal, Diurnal, Canopy roughness, Black spruce, Sphagnum-sedge, Reflected solar radiation, Microrelief.

Diurnal albedo relationships were determined for two bog types in northern Minnesota. Two opposing, cart-mounted Kipp and Zonen pyranometers traversed a tramway to integrate space and time variations of incoming and reflected solar radiation (wave-band 0.3-3.0 microns). The black spruce (Picea mariana (Mill.) B.S.P.) stand's diurnal albedo was parabolic. Albedo increased with solar altitude to a maximum at 1200 h (7-8%) and then decreased. Greatest within-season variation occurred during June and September. Canopy roughness was the dominant influence on albedo variation and differences. The sphagnum-sedge type diurnal albedo was M-shaped. A minimum albedo between two maxima occurred at 1200 h. Albedos increased from the 1200-h minimum to each maxima as a result of reported surface 'flattening' effects, increased specular reflection, and changes in solar radiation quality. Albedos before the first and after the second maxima were dominated by the microrelief roughness of the sphagnum-sedge hummocks. (Stihler-Mass)
W78-08414

VARIATION IN SOIL MOISTURE UNDER NATURAL VEGETATION,
New Mexico State Univ., University Park. Dept. of Agricultural Engineering.
T. W. Sammis, and D. L. Weeks.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 7. Proceedings, Meetings of the American Water Resources Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, April 15-16, 1977, Las Vegas, Nevada, p. 235-240. 3 tab, 1 fig, 4 ref.

Descriptors: *Desert plants, Moisture, *Evapotranspiration, Soil water movement, Sampling, Moisture availability, *Soil-water-plant relationships, Soil surveys, *Cresosote, *Bursage.

Soil water content was measured every two weeks during 1974-75, using a neutron probe at selected locations around the desert plant species creosote (Larria Divaricata), and bursage (Ambrosia Deltoidea), and in an open space. The purpose was to estimate the plants evapotranspiration rate by measuring soil moisture depletion. The sampling problem associated with measuring soil moisture using neutron access tubes is the number, location, and installation depth of the tubes. Analyses of the total soil moisture beneath the creosote plant showed greater variability between access tubes located near different plants the same distance from the crown of the plant than between tubes located around the same plant. Because of the size of the bursage plant, the variability in total soil moisture beneath the plant was greater among tubes around the same plant than between tubes at the same position at different plants. (Payton-Arizona)
W78-08733

2E. Streamflow and Runoff

THE STABILITY OF PARAMETER ESTIMATION IN THE GENERAL LINEAR MODEL,
Ireland Office of Public Works, Dublin.
For primary bibliographic entry see Field 2A.
W78-08282

TIME-SYNCHRONISED STAGE RECORDERS FOR THE MONITORING OF INCREMENTAL DISCHARGE INPUTS IN SMALL STREAMS,
Bristol Univ. (England). Dept. of Geography.
M. G. Anderson, and T. P. Burt.
Journal of Hydrology, Vol. 37, No. 1/2, p 101-109, April 1978. 7 fig, 1 tab, 6 ref.

Descriptors: *Stream gages, *Instrumentation, Equipment, *Water level recorders, *Streamflow, Watersheds(Basins), Streams, Runoff, Base flow, Discharge(Water), Subsurface drainage, Subsurface runoff, On-site investigations, On-site data collections, Electrical equipment, Hydrology, *Stage recorders.

In small catchments the precise timing and magnitude of discharge inputs from various source areas are required for the detailed investigation of catchment hydology processes. A design of an electrical stage recorder was given. The recorded recorder allows synchronous timing of discharge events at various points. Several such stage recorders may be linked to a single multi-channel chart recorder. Results were presented which show the system to be capable of a high degree of resolution in the recording of times of peak discharge at six adjacent sites within a 1.5-sq km upland catchment. (Sims-ISWS)
W78-08284

DILUTION GAUGING ON THE RECESSION LIMB: 2. THE INTEGRATION METHOD,
Institute of Hydrology, Wallingford (England).
K. Gilman.
Hydrological Sciences Bulletin, Vol. 22, No. 4, p 469-481, December 1977. 2 fig, 2 tab, 14 ref.

Descriptors: *Tracers, *Gaging, *Hydrograph analysis, Recession curves, Hydrology, Streams, Flow, Discharge(Water), Equations, Mathematics, Mathematical studies, *Tracer injection, Dilution gauging, Tracer movement, Systematic error.

The application of dilution gauging techniques to natural streams and other variable flows incurs a systematic error caused by the change in discharge with time. On the recession limb of a hydrograph, the change is usually smooth and gradual, and errors can be expected intuitively to be small. In a preceding paper the author investigated errors arising from this cause in the case of a constant rate tracer injection and developed formulas for the calculation of bias from known values of the recession constant and the distribution of residence time in the gauging reach. This paper extended the theory of the residence time model to the case of a dilution gauging by the integration method and presented analogous formulas for the errors. (See also W78-05774) (Lee-ISWS)
W78-08289

NON-TIDAL VARIABILITY IN THE CHESAPEAKE BAY AND POTOMAC RIVER: EVIDENCE FOR NON-LOCAL FORCING,
Johns Hopkins Univ., Baltimore, MD. Chesapeake Bay Inst.
For primary bibliographic entry see Field 2L.
W78-08299

CRITICAL FLOW IN RIVERS WITH FLOOD PLAINS,
LaLonde, Girouard, Letendre and Associates, Montreal (Quebec).
S. Petryk, and E. U. Grant.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 104, No HY5, Proceedings Paper 13733, p 583-594, May 1978. 9 fig, 6 ref, 2 append.

Descriptors: *Critical flow, *Rivers, *Flood plains, *Model studies, Mathematical models, Channels, Channel flow, Flood control, Flow, Hydraulics, Froude number, Analytical techniques.

Problems with the two existing critical flow computation procedures were examined, and a simplified method was proposed for composite section channels. Existing methods, which are based on the minimum in the specific energy curve, can result in two major problems. The first one is that excessively high flow depths may be difined as critical. The second problem is that more than one minimum in the specific energy curve can occur; i.e., more than one flow depth may be defined as critical for a given discharge. The proposed method defines crigtical depth as the level where the discharge weighted Froude number is equal to 1.00. Example computations were carried out for a river and flood plain case. They illustrated the proposed computation procedure and compared the results obtained by the three methods of analysis. (Sims-ISWS)
W78-08568

RIVER TRANSPORT MODELING FOR UNSTEADY FLOWS,
Sutron Corp., Arlington, VA.
T. N. Keefer, and H. E. Jobson.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 104, No HY5, Proceedings Paper 13735, p 635-647, May 1978. 4 fig, 1 tab, 9 ref, 2 append.

Descriptors: *Streamflow, *Unsteady flow, *Mass transfer, *Georgia, Flow, Model studies, Mathematical models, Dye releases, Rivers, River flow, Dispersion, Water levels, Hydraulics, *Chattahoochee River(GA).

Coupled flow-mass transport models were applied to a 17-mile (27.8-km) reach of the Chattahoochee River between Buford and Norcross, Georgia. Discharge variations from 550 cfs to 8,000 cfs (15 cu m/s to 100 cu m/s) in less than 20 min were analyzed. Accompanying stage variations were as much as 7 ft (2 m). Two data sets with 5-min time resolution were used to calibrate and verify the flow model. A longitudinal depth profile at steady low flow also was used in the calibration. Data from a 3-day continuous-injection dye study were used to verify the mass-transport model. The study demonstrated the feasibility of coupled models under highly unsteady flow conditions. The dye study demonstrated the unusual nature of conservative mass transport in unsteady flow. Both the flow and mass-transport models produced answers approaching the accuracy of the data. These are estimated as + or - 29 min in time, + or - 15%-20% for discharge, and + or - 0.5-ft (0.1-m) for stage. (Sims-ISWS)
W78-08569

EFFECT OF RESERVOIRS ON THE DEGREE OF RIVER RUNOFF REGULATION IN THE USSR,
For primary bibliographic entry see Field 4A.
W78-08571

METHOD FOR COMPUTING (BY COMPUTER) THE RETRANSFORMATION OF FLOOD RUNOFF HYDROGRAPHS FOR RIVERS REGULATED BY A CASCADE OF RESERVOIRS (AS EXEMPLIFIED BY THE VOLGA-KAMA CASCADE),
For primary bibliographic entry see Field 4A.
W78-08572

REGIONALIZATION OF THE USSR ACCORDING TO COPHASED ANNUAL RIVER RUNOFF FLUCTUATIONS,
N. V. Lalykin.
Soviet Hydrology: Selected Papers, Vol. 15, No. 2, p 127-132, 1976. 1 tab, 3 fig, 10 ref. Translated from Transactions of the IV All-Union Hydrologic Conference (Trudy IV Vsesoyuznogo gidrologicheskogo s'yezda), Vol. 3, p 307-316, 1975.

Descriptors: *Runoff, *Rivers, *Fluctuations, *Regional analysis, Hydrologic data, Discharge(Water), Annual, Cycles, Foreign research, Foreign countries, River flow, *USSR, Regionalization.

Cophased annual runoff fluctuations are understood to be the single-valued pattern of flow of the phases of the cycles or the synchronism of runoff phases. To regionalize the USSR rivers according to the similarity of cyclic runoff fluctuations, the author used small and medium rivers having a zonal flow regime. For regionalization according to cophasal runoff, 400 rivers were selected with an observation record of not less than 25 years. The dimensions of the river basins were tabulated. The regionalization was performed on the basis of normalized integral difference curves of annual runoff and of correlation coefficients. Within each region a degree of similarity of long-period runoff fluctuations was used for which the longest cycles of any river remained representative. As a rule, this condition is satisfied when the correlation coefficient between the runoff of rivers of a region is no less than 0.50-0.60. Analysis of the data made it possible to identify 40 hydrosynoptic regions. (Humphreys-ISWS)
W78-08573

INVESTIGATION OF THE MAXIMUM RUNOFF OF RIVERS IN THE SOVIET FAR EAST,
D. L. Sokolovskiy, I. F. Goroshkov, Yu. M. Georgiyevskiy, A. A. Samokhin, and N. N. Solov'yeva.
Soviet Hydrology: Selected Papers, Vol. 15, No. 2, p 98-101, 1976. 1 tab, 14 ref. Translated from Transactions of the IV All-Union Hydrologic Conference (Trudy IV Vsesoyuznogo gidrologicheskogo s'yezda), Vol. 3, p 54-60, 1975.

Descriptors: *Runoff, *Runoff coefficients, *Flash floods, *Flood discharge, Peak discharge, River flow, Surface runoff, Foreign research, Foreign countries, Watersheds(Basins), Geographical regions, Asia, Discharge(Water), *USSR(Far Eastern region), Maximum runoff.

To develop maximum runoff standards, a study was made of the runoff of rivers and small watercourses in Far Eastern regions. To obtain field data on the runoff of small watercourses, field investigations were made for 14 years of maximum discharges from the traces of past floods. About 700 watercourses were investigated in the Amur and Lena river basins, on Sakhalin Island, and Kamchatka. Not only these data, but the runoff and precipitation observations of the Hydrometeorological Service, and the results of investigations by the Far Eastern Hydrometeorological Scientific Research Institute, by the Far Eastern State Planning and Surveying Institute of the State Committee for Transportation Construction of the USSR, and other organizations were used to develop the standards. The results of simultaneous runoff and precipitation observations during flood periods were used to compute the runoff coefficients as the ratio of flood runoff depth to the depth of flood-forming precipitation. It was recommended that the tabulated runoff coefficients be used in the developed working formula to compute flash flood discharges of 1% probability. The mean deviation of discharges, computed from this formula, from observed discharges is 10-40%. (Humphreys-ISWS)
W78-08574

COMPUTATION OF THE RAIN RUNOFF OF UNSTUDIED RIVERS IN THE USSR,
For primary bibliographic entry see Field 4A.
W78-08575

PROBLEMS OF THE THEORY OF FLASH FLOOD FORMATION IN THE RIVERS OF THE PERMAFROST ZONE,
Ye. D. Gopchenko.
Soviet Hydrology: Selected Papers, Vol. 15, No. 2, p 91-94, 1976. 5 ref. Translated from Transactions of the IV All-Union Hydrologic Conference (Trudy IV Vsesoyuznogo gidrologicheskogo s'yezda), Vol. 3, p 31-39, 1975.

Descriptors: *Flash floods, *Theoretical analysis, *Hydrograph analysis, *Rainfall-runoff relationships, Runoff, Cold regions, Permafrost, Rivers, Mathematical studies, Foreign research, Analysis, Analytical techniques, Equations, Hydrographs, Recession curves, Mathematical models, *USSR.

The lithological section of permafrost can be a divided arbitrarily into two layers: (1) a very loose active layer having a high infiltration rate, and (2) a virtually impermeable permafrost layer which acts as a water barrier in the warm part of the year and the depth of which is not constant, but increases or decreases depending on the sign of the heat budget at the permafrost table. To describe the formation of runoff from slopes in the zone of active water exchange of the active layer with only slightly changing position of the permafrost table, the differential equations of motion: were used. Developed equations for the rising branch and recession branch of hydrographs of runoff from a slope for variable depth of thawings along the slope for variable depth of thawings along the slope and subsurface runoff were presented. (Humphreys-ISWS)
W78-08576

SOUTHERN ARIZONA FLOODS OF OCTOBER 6-11, 1977,
Weather Service Forecast Office, Phoenix, AZ.
E. J. Perfrement, and R. A. Wood.
Weatherwise, Vol. 31, No. 2, p 66-70, April 1978. 3 fig, 7 photos.

Descriptors: *Arizona, *Floods, *Rainfall, *Disasters, Tropical storms, Data collections, Rivers, Rainfall disposition, Distribution, Isohyets, Flood damage, Flood peak, Storms, Storm runoff, Flooding, Floodwater, Surveys, *Heather, *Gila River, *Santa Cruz River, *San Pedro River.

Arizona is not far from the Pacific Ocean and, therefore, is subject to an occasional tropical storm, especially during September and October. One of these storms, 'Heather' brought near-record rains and flooding to portions of the state on October 6-11, 1977. This storm resulted in a 50 to 100 year flood along the Santa Cruz River from Nogales to Marana. For many areas, the storm values approached, or in some instances exceeded, rainfall totals for an average year. The Santa Cruz's peak discharge from Nogales to Continental reached the so-called '100-year flood level' of 30-40,000 cubic feet per second (cfs), and an estimated 18-25,000 cfs in the Tucson area-a 50-year flood level. Peak discharge on the San Pedro River was an estimated 24,000 cfs at Charleston. Peak discharge on the Gila River at Kelvin was 19,000 cfs. Estimates of up to $13 million in damage resulted from the storm. Most of the damage was confined to the Santa Cruz River, between Nogales and Marana. Particularly hard hit were bridges and roadways, but private property and agriculture also were affected. There were no injuries or deaths in any of the flooding. (Humphreys-ISWS)
W78-08577

2F. Groundwater

DIURNAL PERIODICITY IN GROUND-WATER RECHARGE RATES,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 4B.
W78-08274

SOLUTE TRAVEL TIMES TO WELLS IN SINGLE OR MULTIPLE LAYERED AQUIFERS,
Iowa Agriculture and Home Economics Experimental Station, Ames.
J. Cushman, and D. Kirkman.
Journal of Hydrology, Vol. 37, No. 1/2, p 169-184, April 1978. 6 fig, 11 ref.

Descriptors: *Travel time, *Groundwater movement, *Water wells, *Model studies, Mathematical models, Wells, Drawdown, Injection wells, Pollutants, Path of pollutants, Solutes, Flow, Aquifers, Groundwater, Hydraulic conductivity, Recharge, Hydrology.

Approximate travel times were given for a solute to reach a well from an injection point and for a well of finite radius screened throughout an aquifer resting on an impervious sole where: (1) there is a constant head at the outer boundary of the flow region; and (2) there is no flow across the outer boundary. In both cases, the time of travel for a solute entering the top of the aquifer at a point r sub k satisfies approximately a logarithmic relationship as follows: ln r sub k = A ln t + B where t is the time of travel from the point r sub k to the well, and A and B are constants depending on the problem considered. This linear relationship holds only up to a certain distance of injection from the well. This distance varies with the problem considered. (Sims-ISWS)
W78-08288

DETERMINATION OF AQUIFER PARAMETERS FOR A MULTIPLE WELL SYSTEM,
Middle East Technical Univ., Ankara (Turkey). Dept. of Engineering Sciences.
Y. Corapcioglu.
Hydrological Sciences Bulletin, Vol. 22, No. 4, p 483-486, December 1977. 1 fig, 1 tab, 5 ref.

Descriptors: *Aquifer characteristics, *Hydraulic properties, *Aquifer testing, *Graphical methods, Transmissivity, Storage coefficient, Aquifers, Water wells, Observation wells, Curves, Type curves, Multiple well system.

A curve fitting method was described which determines the storage coefficient and transmissivity of an extensive aquifer in which several wells are pumping simultaneously. A family of type curves was constructed using several values of S/T. For any assumed value of S/T, there is a type curve for which 1/t is the independent variable and Sigma Q sub iW(u sub i) is the dependent variable. If the discharge is the same for each well, Sigma W(w sub i) can be plotted, instead, as the dependent variable. The assumptions and restrictions for the proposed method are similar to those which apply to the Theis curve-fitting method. (Visocky-ISWS)
W78-08290

A MATHEMATICAL MODEL OF STRATIFIED GROUNDWATER FLOW,
Egyptian Desert Inst., Cairo. Water Resources Div.
N. Rofail.
Hydrological Sciences Bulletin, Vol. 22, No. 4, p 503-512, December 1977. 4 fig, 3 ref.

Descriptors: *Stratification, *Saline water intrusion, *Mathematical models, *Aquifers, Groundwater movement, Boundaries(Surfaces), Groundwater recharge, Equations, Numerical analysis, Computer programs, Hydrologic boundaries.

The problem of stratified groundwater flow (salt water intrusion) was considered in the general case where the hydrological boundaries can have any shape and the impervious bed can have any configuration. The recharge and discharge also can be considered according to any given function of time. The fluid density was assumed to be constant throughout each layer. The effect at the boundaries was considered, whether the boundaries were a river or a continuation of the aquifer with different parameters. The systems of equations were taken in alternative matrix forms. The three time level implicit scheme was used, and the multi sweep method was applied for the computation. The numerical procedure of the mathematical model is linearly unconditionally stable. In this procedure, no iteration routines were introduced, and therefore, it was considered exceptionally economical in memory and in computing time. (Visocky-ISWS)
W78-08291

USE OF TRACERS TO CONFIRM GROUNDWATER FLOW,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, NY. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5B.
W78-08296

UNDERGROUND RESERVOIRS TO CONTROL THE WATER CYCLE,
Food and Agriculture Organization of the United Nations, Rome (Italy).
For primary bibliographic entry see Field 4B.
W78-08297

GROUND WATER MANUAL, A GUIDE FOR THE INVESTIGATION, DEVELOPMENT, AND MANAGEMENT OF GROUND-WATER RESOURCES.
Bureau of Reclamation, Washington, D.C.
Stock Number 024-003-00106-6 For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, and the Bureau of Reclamation, Engineering and Research Center, P.O. Box 25007, Denver Federal Center, Denver, Colo. 80225. Water Resources Technical Publication, First Edition, 1977. 480 p, 104 fig, 35 tab, 272 ref, append.

Descriptors: *Groundwater, *Publications, *Aquifers, Base flow, Groundwater resources, Aquifer testing, Aquifer systems, Data collections, Groundwater movement, Groundwater potential, Aquifer yield estimation, Water wells, Borehole geophysics, Permeability tests, Well design, Dewatering systems, Drilling, Pumps, Well specifications, Well sterilization, Bibliographies, Well-aquifer relationships, Infiltration, Corrosion, Incrustation, Turbine pumps, Well rehabilitation.

This manual has been prepared as a guide to field personnel in the more practical aspects and commonly encountered problems of ground-water investigations, development, and management. Information is presented concerning such aspects as ground-water occurrence and flow, well-aquifer relationships, ground-water investigations, aquifer test analysis, estimating aquifer yield, data collection, and geophysical investigations. In addition, permeability tests, well design, dewatering systems, well specifications and drilling, well sterilization, pumps, and other aspects have been discussed. An extensive bibliography has also been included. The manual has been developed over a period of years, and its many contributors have diversified technical backgrounds. Contributors include personnel from the Bureau of Reclamation Engineering and Research Center and field offices, other agencies, foreign governments, and many individual scientists and engineers. (Bur Reclam)
W78-08542

EXACT SOLUTIONS FOR TWO-DIMENSIONAL GROUNDWATER FLOW PROBLEMS INVOLVING A SEMI-PERVIOUS BOUNDARY,
Rijkswaterstaat, Rijswijk (Netherlands). Data Processing Div.
P. Van der Veer.
Journal of Hydrology, Vol. 37, No. 1/2, p 159-168, April 1978. 9 fig, 3 ref.

Descriptors: *Groundwater movement, *Groundwater, *Subsurface drainage, *Model studies, Mathematical models, Drainage, Soil water, Soil water movement, Equations, Boundary layers, Permeability, Soil science, Polders, Semipervious layers.

Defined herein were an analytical function (V) of the complex potential (omega) and its derivative with respect to the complex coordinate (z) which can be used to find exact solutions for two-dimensional groundwater flow problems involving a semi-pervious boundary. Boundary conditions may involve a semi-pervious layer of constant resistance, vertical equipotential lines, and vertical stream lines. Solutions were found by conformal mapping of the V-plane on the z-plane and by solving the first-order differential equation that is formed by the relationship between V and z. Some examples of the use of the function V were given. (Sims-ISWS)
W78-08547

RESULTS OF PUMPING TESTS IN CRYSTALLINE-ROCK AQUIFERS,
Geraghty and Miller, Inc., Tampa, FL.
For primary bibliographic entry see Field 4B.
W78-08556

HYDROGEOLOGY OF THE MEDICINE HAT AREA, ALBERTA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 4B.
W78-08580

2G. Water In Soils

EFFICIENT PREDICTION OF GROUND SURFACE TEMPERATURE AND MOISTURE, WITH INCLUSION OF A LAYER OF VEGETATION,
National Center for Atmospheric Research, Boulder, CO.
J. W. Deardoff.
Journal of Geophysical Research, Vol 83, No C4, p 1889-1903, April 20, 1978. 11 fig, 3 tab, 49 ref.

Descriptors: *Soil temperature, *Soil moisture, *Vegetation effects, *Model studies, Mathematical models, Vegetation, Soil properties, Evaporation, Evapotranspiration, Solar radiation, Forecasting, Estimating equations, Energy budget, Rainfall, Drying, Temperature, Moisture content.

An efficient time-dependent equation for predicting ground surface temperature was tested against a 12-layer soil model and compared with five other approximate methods in current use. It was found to be generally superior if diurnal forcing is present and very much superior to the use of the insulated surface assumption. An analogous method of predicting ground surface moisture content was presented. The method allows the surface to become moist quickly during improved methods are not of much relevance unless the main influences of a vegetation layer are included. Therefore, an efficient one-layer foliage parameterization was developed that extends continuously from the case of no shielding of the ground by vegetation to complete shielding. It included influences of both ground and foliage albedos and emissivities, net leaf area index, stomatal resistance, retained water on the foliage, and several other considerations. When it was tested against data for wheat, the one-layer parameterization appeared to be quite adequate despite the many simplifying assumptions. The parameterization predicted that errors of up to a factor of 2 in evapotranspiration can be incurred by ignoring the presence of a vegetation layer. (Sims-ISWS)
W78-08275

WATER YIELD OF LOW-ALPINE SNOW TUSSOCK GRASSLAND IN CENTRAL OTAGO,
Otago Univ., Dunedin (New Zealand). Dept. of Botany.
A. F. Mark, and J. Rowley.
Journal of Hydrology (New Zealand), Vol 15, No 2, p 59-79, 1976. 15 fig, 3 tab, 13 ref.

Descriptors: *Water yield, *Grasslands, *Alpine, Hydrology, Transpiration, Interception, Watersheds(Basins), Hydrologic budget, Soils, Water balance, Snow, *New Zealand, *Otago(New Zealand), Snow tussock grassland.

Transpiration and interception studies have confirmed earlier claims that the increased water surplus under large snow tussocks results from their substantial gains by interception. This more than compensates for their relatively high transpiration. With water potentially the most valuable product of many high mountain areas, and the water-deficient Taieri catchment in particular, the conclusion that the maximum water yield (and control) from the low-alpine snow tussock grasslands was obtained (in this region at least) from a natural undisturbed cover warrants testing on a larger scale. Fifteen non-weighing lysimeters somewhat smaller than a unit area of a single snow tussock, operated for six years in low-alpine snow tussock grassland at c. 1000 m on Rock and Pillar Range, have shown that the type and condition of plant

cover can modify appreciably the water yield. Untreated snow tussocks provided the greatest water surplus: 63% of the 1348 mm mean annual raingauge catch, while a sward of blue tussock yielded significantly less (49%). Snow tussocks which initially were either burned or severely clipped were associated with intermediate yields: 60% and 54%, respectively, for the six-year period, although annual throughput from the burned plants showed a significant increase with time, relative to that of the normal tussocks, coinciding with their recovery. Water surplus under bare soil (56%) was also intermediate between normal snow tussocks and the blue tussock sward. (Lee-ISWS)
W78-08277

EVAPORATION FROM HORIZONTAL SOIL COLUMNS WITH VARIABLE DIFFUSIVITY,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2D.
W78-08286

WATER MOVEMENT IN POROUS MEDIA TOWARDS AN ICE FRONT,
Technische Hogschool, Eindhoven (Netherlands). Dept. of Technical Physics.
For primary bibliographic entry see Field 2C.
W78-08287

EROSION OF COHESIVE SOILS,
Stuttgart Univ. (West Germany). Inst. fuer Theoretische und Angewandte Physik.
For primary bibliographic entry see Field 2J.
W78-08294

WATER MOVEMENT IN BARE AND CROPPED SOIL UNDER ISOLATED TRICKLE EMITTERS: I. ANALYSIS OF BARE SOIL EXPERIMENTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
W. A. Jury, and K. D. Earl.
Soil Science Society of America, Journal, Vol. 41, No. 5, p 852-856, September-October, 1977. 8 fig, 1 tab, 12 ref.

Descriptors: *Soil water movement, *Irrigation efficiency, *Water content, *Ponding, *Loam, Irrigation practices, Hydraulic conductivity, Tensiometers, Irrigated land, *Trickle irrigation.

Water movement in arid-land irrigated soils is important to crop production, and is studied extensively in the Southwest. A field experiment on a Buren sandy loam with a low saturated hydraulic conductivity is reported here. Water movement in soil irrigated from a single isolated trickle emitter was observed. Soil water movement was followed by tensiometers and gravimetric water-content sampling, and surface ponding was photographed. More water moved laterally in the weekly irrigation plots than in the daily ones, which required consideration of surface-ponding effects for mathematical modeling. (Popkin-Arizona)
W78-08313

SALINITY AND NITROGEN MINERALIZATION IN SOIL,
Indian Agricultural Research Inst. New Delhi. Div. of Soil Science and Agricultural Chemistry.
R. D. Laura.
Soil Biology and Biochemistry, Vol. 9, p 333-336, 1977. 5 tab, 22 ref.

Descriptors: *Salinity, *Nitrogen, *Ammonification, *Soil amendments, Nutrients, Crop production, Plant growth, Soil moisture, Sandy loam, Laboratory tests, Ammonia, Nitrates, Nitrites, Fertilizers, Ureas, Arid lands, Nitrogen transformations, Nitrogen mineralization, Soil processes, Compost.

Next to soil moisture, salinity and nutrients are the limiting factors for crop production and plant growth. The effects of salinity on ammonification, nitrification and mineral nitrogen accumulation in incubated soils are studied in a laboratory experiment using a sandy loam soil in New Delhi, India. NH4-N, NO2-N and NO3-N were measured periodically for 102 days in the laboratory soil and in soil amended with farm compost, mustard oil cake or urea. While increased salinity retarded ammonification, it did not suppress it completely. Nitrification was retarded, suppressed or inhibited completely by salinity, depending on the amount of salt and amendment type. Accumulated mineral N decreased with increased salinity. Possible mechanisms for these relations are briefly noted. (Popkin-Arizona)
W78-08337

SOLUTE TRANSFER, WITH EXCHANGE BETWEEN MOBILE AND STAGNANT WATER, THROUGH UNSATURATED SAND,
Universite Scientifique et Medicale de Grenoble (France). Inst. de Mecanique.
J. P. Gaudet, H. Jegat, G. Vachaud, and P. J. Wierenga.
Soil Science Society of America Journal, Vol 41, No 4, p 665-671, July - August, 1977. 6 fig, 2 tab, 22 ref.

Descriptors: *Ion transport, *Stagnant water, *Unsaturated flow, *Soil water movement, *Leaching, Sands, Irrigation efficiency, Soil water, Salinity, Mathematical models, Water content, Diffusion, Dispersion, Soil-water chemistry, Soil chemical properties.

Solute movement in soils is an extensively researched field in the arid-land irrigation agriculture of the Southwest U.S. Solute movement in soils is of interest for improving leaching and irrigation efficiency. The equation which describes solute movement in soil is reviewed, and the assumption that the solute does not react with the media is discussed. Salt concentrations were measured in place along the flow axis and at the exit of an unsaturated column of graded sand, and leached at a constant rate with water containing noninteracting salt. Observed and computed solute distribution profiles were compared. Dispersion coefficients, diffusional mass transfer coefficients, and fraction mobile water were obtained at one depth, and used to calculate values at other depths. Excellent agreement between observed and computed values were obtained. The model, which accounts for stagnant and reactive solute, presented a good description of solute transfer and exchange between mobile and stagnant water. The amount of stangnat water increased with decreasing water content. The apparent dispersion coefficient decreased with decreasing water content. The model explains solute tailing, stagnant water and slow diffusion in unsaturated soils. (Popkin-Arizona)
W78-08360

DETERMINING CATION EXCHANGE CAPACITY: A NEW PROCEDURE FOR CALCAREDUS AND GYPSIFEROUS SOILS,
Agricultural Research Service, Riverside, CA. Salinity Lab.
M. Polemio, and J. D. Rhoades.
Soil Science Society of America, Journal, May-June 1977, Vol 41, No 3, p 524-528. 2 tab, 2 fig, 23 ref.

Descriptors: *Cation exchange, *Soil chemistry, *Soil chemical properties, *Soil analysis, *Laboratory tests, Calcareous soils, Sodium chloride, Magnesium compounds, Mineralogy, Calcite, Leaching, Gypsiferous soils, Exchangeable sodium compounds, Magnesium compounds.

Soil-chemical properties determine the quality of leached water in irrigated arid land soils. A new, two-step procedure for determining cation exchange capacity (CEC) of calcareous and gypsiferous soils is presented. Soil sample is saturated with sodium by four successive equilibrations using NaOAc-NaCl solution. The saturated sample then is extracted with three increments of MgNO3. Total Na and Cl are determined in the extracted solution. Total Cl is determined so that soluble Na may be deducted from the total Na. The exchangeable na, or total Na less soluble Na, is equivalent to the CEC. The method eliminates most errors inherent in conventional methods. (Popkin-Arizona)
W78-08361

SOIL MOISTURE EFFECTS ON TRANSPIRATION AND NET CARBON DIOXIDE EXCHANGE OF SORGHUM,
Kansas State Univ., Manhattan. Dept. of Agronomy.
C. R. Sumavao, E. T. Kanemasu, and T. Hodges.
Agricultural Meteorology, Vol 18, p 401-408, 1977. 5 fig, 1 tab, 12 ref.

Descriptors: *Soil moisture, *Transpiration, *Carbon dioxide, *Sorghum, *Soil-water-plant relationships, Arid lands, Moisture stress, Irrigated land, Crop production, Plant growth, Energy budget, Air temperature, Stomata, Photosynthesis.

Sorghum is a common crop in the American arid and semi-arid lands, as it is in Kansas. This field study determined the effect of soil moisture on net carbon dioxide exchange (NCE) and transpiration of sorghum (Sorghum bicolor). Test crops were grown under well-watered and water-stressed conditions at the Evapotranspiration Experimental Site southwest of Manhattan, Kansas. Adjacent 5m x 6m plots were used. The one plot was artificially stressed by withholding rainfall intentionally through the use of a movable shelter. The well-watered plot was irrigated initially and regularly to assure a uniform stand. Components of the energy balance, soil moisture, leaf and air temperature, stomatal resistance, and leaf-water potential used to determine NCE and transpiration rates. Transpiration and NCE rates were reduced when available soil moisture was less than 35 percent of maximum, or 91 mm and the rate was enhanced by air temperatures exceeding 33C. Photosynthetic rates declined when leaf temperatures exceeded 33C. At and below the critical soil-moisture level, leaf-water potential decreased and resistance to vapor transport increased; that reduced transpiration and NCE rates. Figures show seasonal patterns of available soil moisture; daily trends in potential and actual transpiration, NCE rates, and leaf and air temperatures; near midday differences in temperatures as a function of soil moisture. A table shows estimated stomatal resistance of crops under both treatment. (Popkin-Arizona)
W78-08362

SPECIFIC SURFACE CHARACTERISTICS OF ARIZONA SOILS,
Arizona Agricultural Experiment Station, Tucson.
D. F. Post.
Journal of the Arizona Academy of Science, Vol 12, No 1, p 12-14, February 1977. 2 tab, 18 ref.

Descriptors: *Arizona, Arid climates, On-site data collections, *Clays, Soil investigations, Soil moisture, *Soil analysis, *Soil types, *Irrigation effects, Irrigation water, Sampling, Analytical techniques, *Soil physical properties.

Lack of rainfall has restricted agricultural expansion in southern and central Arizona to those areas receiving irrigation water. Samples of ten representative soils, ranging from loamy sand to clay, were collected and analyzed from test sites in Maricopa, Pinal and Pima Counties. Specific surface data, related soil properties were summarized. The per cent of clay in these ten soils was found to be the predominant factor determining the soil's specific surface. (Jewkes-Arizona)
W78-08364

SOIL WATER CHANGES IN THE CREOSOTEBUSH AND BUR-SAGE DURING A DRY PERIOD IN SOUTHERN ARIZONA,
Rocky Mountain Forest and Range Experiment Station, Flagstaff, AZ.
D. R. Cable.
Journal of the Arizona Academy of Science, Vol 12, No 1, p 15-20, February, 1977. 6 fig.

Descriptors: *Arizona, *Soil water movement, Recharge, Sampling, Evapotranspiration, Evaporation, Moisture deficit, Desert plants, Arid climates, Precipitation(Atmospheric), Impact(Rainfall), On-site investigations, Water utilization, *Creosotebush, *Bur-sage.

This study was designed to investigate the seasonal pattern of soil water recharge and use by two Sonoran desert shrubs, creosotebush (Larrea divaricata) and bursage (Ambrosia deltoidea), at five sites. Recharge and soil water depletion were measured within stands of creosotebush and bursage from June 1974 to December 1975. Results demonstrated: (1) soil water was rapidly extracted following recharge, within two or three weeks, during the winter and spring; (3) evaporation of soil water from bare areas, and (4) creosotebush and bur-sage were able to exist during relatively long periods of almost no precipitation. (Jewkes-Arizona)
W78-08368

DETERMINATION OF KINETICS OF PHOSPHORUS MINERALIZATION IN SOILS UNDER OXIDIZING CONDITIONS,
Kansas State Univ., Manhattan. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-08378

FERTILIZER AND PESTICIDE MOVEMENT FROM CITRUS GROVES IN FLORIDA FLATWOOD SOILS,
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
For primary bibliographic entry see Field 5B.
W78-08379

A POSSIBLE MODEL FOR THE SURFACE-INDUCED HYDROLYSIS OF ORGANO PHOSPHORUS PESTICIDES ON KAOLINITE CLAYS,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
U. Mingelgrin, S. Saltzman, and B. Yaron.
Soil Science Society of America Journal, Vol 41, No 3, p 519-523, May-June, 1977. 4 tab, 1 fig, 28 ref.

Descriptors: *Hydrolosis, *Pesticides, *Organophosphorus compounds, *Organic pesticides, *Chemical degradation, *Kaolinite, Clays, Phosphorus, Laterites, Hydrosols, Pesticide removal, Adsorption, Soil moisture, Cations, Catalysis, Soil chemical properties.

Because pesticides are commonly applied to aridland irrigated soils, pesticide degradation is an important research area for irrigated lands in the Southwest U.S. Kaolinite, an important component in southwestern U.S. and tropical soils, particularly Ultisols and Oxisols, is a potential carrier of some pesticides because of pesticide-kaolinite interaction. Kaolinite enhancement of pesticide degradation, degradation at specific adsorption sites, the moisture and cation dependence of kaolinite's catalytic activity, the phosphate hydrolysis product, and surface-induced hydrolysis of pesticides are reviewed. A mechanism of surface hydrolysis is introduced which accounts for the susceptibility of organophosphate ester molecules to hydrolysize the phosphate ester bond, where the molecules are then rapidly degraded on the kaolinite surfaces. The ligand water associated with counter ions performs the hydrolysis of the organophosphate molecules. The degradation of the pesticide depends on the saturating cation and its hydration status. The model is based on collected and reviewed data for a number of organophosphorus insecticides, particularly parathion. (Popkin-Arizona)
W78-08391

WATER MOVEMENT IN BARE AND CROPPED SOIL UNDER ISOLATED TRICKLE EMITTERS: II. ANALYSIS OF CROPPED EXPERIMENTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
K. D. Earl, and W. A. Jury.
Soil Science Society of America Journal, Vol 41, No 5, p 856-861, September-October, 1977. 6 fig, 4 tab, 21 ref.

Descriptors: *Soil water movement, *Crop response, *Irrigation efficiency, *Crop production, *Moisture stress, Irrigation practices, Irrigation systems, Hydraulic conductivity, Tensiometers, Water content, Ponding, Evapotranspiration, Root distribution, Irrigated land, Loam, Vegetable crops, *Trickle irrigation.

Water movement in arid land irrigated soils is important to crop production, and is studied extensively in the Southwest U.S. A field experiment on a Buren sandy loam with a low saturated hydraulic conductivity, and cropped with summer squash (Zucchini) is reported. Water movement in soil irrigated from a single isolated trickle emitter was observed. Soil water movement was followed by tensiometers and gravimetric water-content sampling, and surface ponding was photographed. Replicated plots receiving the same volumes of water were irrigated three times daily and once a week. Irrigation volumes were adjusted according to evapotranspiration and tensiometric data. Weekly irrigations produced greater water movement both laterally and vertically downward than daily irrigations. There was greater root density beneath emitters because of water stress. Zucchini yields in the outer ring of weekly irrigated plants were 30 percent higher than the most productive daily irrigated plots. Total green matter and dry matter yields were greater in weekly irrigated plots. Crops watered by widely spaced emitters on low conductivity soils might yield better under weekly irrigations than under more frequent irrigations. (Popkin-Arizona)
W78-08392

ANALYSIS OF ESTUARINE SOIL GRADIENTS IN SALT MARSHES OF THE SOUTHWESTERN NETHERLANDS WITH SPECIAL REFERENCE TO THE SCHELDT ESTUARY,
Delta Inst. for Hydrobiological Research, Yerseke (Netherlands).
For primary bibliographic entry see Field 5A.
W78-08407

PROTON BINDING IN FULVIC ACID EXTRACTED FROM SEWAGE SLUDGE-SOIL MIXTURE,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
For primary bibliographic entry see Field 5A.
W78-08462

SOIL PERCOLATION TESTS IN THE LAGOS AREA,
Lagos Univ. (Nigeria).
For primary bibliographic entry see Field 5B.
W78-08464

THE MOVEMENT OF SEWAGE EFFLUENT THROUGH SOIL COLUMNS: THE MAJOR IONS (NA, CA, MG, CL, AND SO4),
Saskatchewan Univ., Saskatoon. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W78-08492

FLOW AGAINST DISPERSION IN NONADSORBING POROUS MEDIA,
California Univ., Davis. Dept. of Land, Air and Water Resources; and California Univ., Davis. Dept. of Civil Engineering.
M. A. Marino.
Journal of Hydrology, Vol. 37, No. 1/2, p 149-158, April 1978. 12 ref, 1 append.

Descriptors: *Dispersion, *Flow, *Porous media, *Soil water movement, Model studies, Mathematical models, Groundwater, Soil water, Solutes, Tracers, Equations, Mathematics, Aquifers, Water quality, Path of pollutants.

Analytical solutions were developed for dispersion problems in finite nonadsorbing porous media in which the flows are opposite to the dispersion. The flows were assumed to be one-dimensional in a horizontal direction, and the average velocities were taken to be constants throughout the flow fields. Concentrations varying as exponential functions of time were enforced at the source of the dispersion, while a condition in which the change in concentration is proportional to the flow was applied at the other boundary. Also included were solutions that take into account the decay of a radioactive tracer as it is being transported through nonadsorbing porous media. Different forms for the solutions were given to facilitate the computation of particular values. The solutions are useful for analyzing the possible prevention of the spread of poor-quality water by a flow of freshwater. (Sims-ISWS)
W78-08546

HYDRODYNAMIC DISPERSION DURING ABSORPTION OF WATER BY SOIL,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
D. E. Smiles, J. R. Philip, J. H. Knight, and D. E. Elrick.
Soil Science Society of America Journal, Vol. 42, No. 2, p 229-234, March-April 1978. 7 fig, 2 tab, 14 ref.

Descriptors: *Dispersion, *Soil water movement, *Solutes, *Absorption, Laboratory tests, Leaching, Unsteady flow, Unsaturated flow, Soil water, Soil properties, Moisture content, Salts, Hydrodynamics, Soils, Soil science.

An experimental study is reported of hydrodynamic dispersion of low concentration solutions during absorption into horizontal columns of soil with initially uniform moisture and solute contents. The initial soil solutions were of relatively high salt concentration. It was found that both the water and salt concentration profiles preserved similarity in terms of distance divided by the square root of time. This observation implies that the longitudinal dispersion coefficient is insensitive to pore water velocity and may be taken as a function of the volumetric water content only, at least for a given initial (low) moisture content. The formulation which follows is frankly phenomenological. It provides a simple means of predicting dispersion during flow in unsaturated soils which promises to be sufficiently accurate for most purposes. (Sims-ISWS)
W78-08557

PERTINENT CRITERIA FOR DESCRIBING THE DISSOLUTION OF GYPSUM BEDS IN FLOWING WATER,
Georgia Coastal Plain Experimental Station, Tifton, Dept. of Agronomy.
T. C. Keisling, P. S. C. Rao, and R. E. Jessup.
Soil Science Society of America Journal, Vol. 42, No. 2, p 234-236, March-April 1978. 1 fig, 4 ref.

Descriptors: *Gypsum, *Dissolved solids, *Mass transfer, Model studies, Mathematical models, Solutes, Flow, Dispersion, Erosion, Soils, Soil science, *Dissolution, Dissolution coefficient.

The equation for convective-dispersive solute transport in porous beds and the continuity equation were used to derive a relationship describing the dissolution of gypsum beds in flowing water. The parameters involved in the derived relationship were: bed length, solution flow velocity, dispersion coefficient, mass transfer rate coefficient, and gypsum fragment size. The proposed relationship was compared with previously published data and shown to be valid. A potential practical field application of the procedure was presented. (Sims-ISWS)
W78-08558

CALIBRATION STABILITY AND RESPONSE TIME FOR SALINITY SENSORS,
Agricultural Research Service, Riverside, CA. Salinity Lab.
J. D. Wood.
Soil Science Society of America Journal, Vol. 42, No. 2, p 248-250, March-April 1978. 1 fig, 4 tab, 14 ref.

Descriptors: *Instrumentation, *Salinity, *Saline soils, *Calibrations, Equipment, Laboratory tests, Stability, Electrical conductance, Measurement, Soil science, Sensors, Salinity sensors, Sensor calibration, Response time, Calibration stability.

Commercially produced salinity sensors removed from field and lysimeter experiments lasting from 3 to 5 years were tested for calibration stability relative to the original factory calibration. Significant changes in calibration occurred in up to 14% of the sensors after 4 and 5 years of use. Response to a step-change in salinity also was examined for commercial units in a field installation. Calculated response factors were lower than those found in a previous laboratory experiment. However, response was sufficiently rapid to assure accurate readings if changes in salinity occur in time intervals exceeding 5 days. (Sims-ISWS)
W78-08559

THEORETICAL MODELING OF MIXED-ELECTROLYTE SOLUTION FLOWS FOR UNSATURATED SOILS,
Agricultural Research Organization, Bet Dagan (Israel). Div. of Soil Physics.
E. Bresler.
Soil Science, Vol. 125, No. 4, p 196-203, April 1978. 20 ref.

Descriptors: *Mathematical models, *Unsaturated flow, *Salts, *Soils, Theoretical anaysis, Equations, Calcium, Sodium, Convection, Diffusion, Dispersion, Ion exchange, Hydraulic conductivity, Mixed salt solution, Double-layer theory, Coupling.

A mixed salt solution with ions that interact with the soil matrix are important in field problems involving the simultaneous flow of water and mixed Na-Ca salts in unsaturated soils. Governing partial differential equations describing transient, one-dimensional, simulatneous transfer of mixed anions, cations, and water were formulated, taking into account physicochemical interaction between mono and divalent ions and the soil matrix. Effects of convection, diffusion, mechanical dispersion, anion exclusion, cation exchange and adsorption, and coupling phenomena were considered jointly. Soil-interacting and coupling parameters were estimated theoretically from mixed-ion diffuse double-layer theory, taking into account tactoids, capillarity, and hydrodynamic considerations. The coupling-interacting parameters included; osmotic efficiency coefficient, anion exclusion, cation exchange equilibria, soil water retentivity, and unsaturated hydraulic conductivity and their dependence on soil water content and soil solution concentration and composition. A finite difference approach that eliminates numerical dispersion was used to approximate the nonlinear partial differential equations and the boundary conditions appropriate to infiltration, redistribution, drainage, and evaporation of soil water. A brief computational scheme concluded the paper. (Visocky-ISWS)
W78-08563

A SOIL COLUMN TENSION LYSIMETER THAT MINIMIZES EXPERIMENTAL EDGE EFFECTS,
Dartmouth Coll., Hanover, NH. Dept. of Biological Sciences.
C. S. Cronan.
Soil Science, Vol 125, No 5, p 306-309, May 1978. 2 fig, 2 tab, 12 ref.

Descriptors: *Lysimeters, *Leachate, *Soil chemistry, *Infiltration, *Percolation, Instrumentation, Infiltrometers, Runoff, Soil water, Leaching, Solubility, Percolating water, Rainfall-runoff relationships, Seepage, Penetration, Soil physical properties, Soil water movement, *Tension lysimeter, *Edge effects.

A new tension lysimeter, intended for use with isolated, undisturbed soil columns, has been developed. This lysimeter offers the following advantages: it is inexpensive; it minimizes problems associated with experimental edge effects; it is essentially chemically inert; and it permits sampling both saturated and unsaturated flow in soil leaching experiments. Data were presented to illustrate the relatively low variability observed in flow volumes and leachate chemistry between replicate undisturbed soil columns receiving identical treatments. (Henley-ISWS)
W78-08565

DISPERSION STUDY OF BURIED ELEMENTAL MERCURY,
Du Pont de Nemours (E. I.) and Co., Aiken, SC. Savannah River Lab.
For primary bibliographic entry see Field 5E.
W78-08655

A NEW DIELECTRIC SOIL MOISTURE METER FOR FIELD MEASUREMENT OF SOIL MOISTURE,
Technical Univ. of Prague (Czechoslovakia). Dept. of Irrigation and Drainage.
E. V. Kuraz, and J. Matousek.
International Commission on Irrigation and Drainage, Vol 26, No 1, p 76-79, January, 1977. 3 fig, 5 ref.

Descriptors: *Soil moisture measurement, Soil water, Soil properties, Bulk density, Sampling, *Measurement(Dielectric method).

A new apparatus for the soil moisture measurement in field conditions by a dielectric method has been developed. The arrangement is based on the principle of the capacitance--frequency convertor. With a good operating reliability and temperature stability, a miniaturization of the device has been reached. The apparatus works in the whole range of moisture content, the measurement is also influenced by the change of bulk density. The temperature change is irrelevant and the sensitivity to the change of the chemical composition is low. The measuring procedure is very simple, the reading is possible either on the scale, or a registering apparatus can be connected. For each soil a calibration curve has to be determined. (Skogerboe-Colorado State)
W78-08707

DEEP PLOWING, CURE FOR SODIC CLAYPAN,
Agricultural Research Service, Mandan, ND.
For primary bibliographic entry see Field 3F.
W78-08708

OUR NEWEST NATURAL RESOURCE--COMPACTION--GOOD AND BAD EFFECTS ON ENERGY NEEDS,
Agricultural Research Service, Morris, MN.
For primary bibliographic entry see Field 3F.
W78-08709

MODELING INFILTRATION UNDER MOVING SPRINKLER IRRIGATION SYSTEMS,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
D. C. Slack.
Paper No. 77-2557, (1977). Presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Palmer House Hotel, Chicago, Illinois. 23 p, 9 fig, 1 tab, 21 ref.

Descriptors: *Model studies, Infiltration, *Sprinkler irrigation, Irrigation, *Irrigation systems, Soils, Simulation analysis, *Mein and Larson model, *Irrigation soils.

A modified Mein and Larson model was employed to predict time to surface ponding under two types of center pivot irrigation systems on two agricultural soils. Results were compared with those observed in the field. The model did a good job of predicting time to surface ponding but did not perform as well as for predicting volume infiltrated at ponding. (Skogerboe-Colorado State)
W78-08720

EXPERIMENTAL EVALUATION OF TWO INFILTRATION EQUATIONS,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
F. Idike, C. L. Larson, D. C. Slack, and R. A. Young.
Paper No. 77-2558, (1977). Presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Palmer House Hotel, Chicago, Illinois. 21 p, 6 fig, 4 tab, 21 ref.

Descriptors: *Infiltration, Soil water, Soil moisture, *Soil water movement, *Runoff forecasting, *Equations, Evaluation, Application rates, *Holtan equation, *Mein and Larson equation, Forecasting.

Infiltration from constant application rates as predicted by the Holtan equation and the Mein and Larson equation was compared to values determined experimentally. Both equations did a good job of predicting infiltration during latter and middle portions of the experimental runs. The Mein and Larson equation did a good job of predicting time to start of runoff, while the Holtan equation generally underpredicted infiltration during initial stages of the runs. (Skogerboe-Colorado State)
W78-08721

THE CONTROL OF NITRATE AS A WATER POLLUTANT,
Texas Agricultural Experiment Station, College Station.
For primary bibliographic entry see Field 5G.
W78-08723

RESIDUAL WAXES FOR WATER HARVESTING,
Agricultural Research Service, Phoenix, AZ. Water Conservation Lab.
For primary bibliographic entry see Field 3B.
W78-08731

VARIATION IN SOIL MOISTURE UNDER NATURAL VEGETATION,
New Mexico State Univ., University Park. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2D.
W78-08733

EFFECT OF GRAZED LUCERNE ON THE MOISTURE STATUS OF WHEAT GROWING SOILS,
New South Wales Dept. of Agriculture (Australia). Tamworth Agricultural Research Center.
For primary bibliographic entry see Field 3F.
W78-08744

OBSERVATIONS OF SOIL WATER AND SALT MOVEMENT UNDER DRIP AND FLOOD IRRIGATION IN AN APPLE ORCHARD,
Commonwealth Scientific and Industrial Research Organization Merbein (Australia). Div. of Horticultural Research.
For primary bibliographic entry see Field 3C.
W78-08745

NATURE AND IMPACT OF TEMPERATURE AND MOISTURE IN ARID WEATHERING AND SOIL FORMING PROCESSES - A REVIEW.
Ghent Rijksuniversiteit (Belgium). Lab. for Physical Geography and Pedology.
W. Verheye.
Pedologie, Vol 26, No 3, p 205-224, 1976. 2 fig, 4 tab, 40 ref.

Descriptors: *Weathering, *Soil formation, *Soil moisture, *Rock properties, *Dew, *Reviews, Leaching, Rainfall, Antecedent moisture content, Microenvironment, Rock mechanics, Soil types, Salts, Gypsum, Chlorides, Dune sands, Arid lands, Soil chemical properties, Iran, Israel, Kenya.

Arid and semiarid areas are defined by climate, vegetation, soil type, and especially temperature and moisture as soil temperature and rainfall regimes. Examples of time variability of rainfall data for stations in Iran, Israel, and Kenya and its spatial variability are commonly used to explain the local occurrence of Argids in the desert. Leaching and clay movement are the result of hazardous but important soil moistening. The effectivness of rainfall as a source of soil moisture is reviewed, where amount of rain, antecedent conditions, type and stage of vegetative cover, soil texture and structure, and runoff effects are important. Atmospheric dew, linked not only to high air moisture but to thermic and hydric profile of the soil, is a main promoter of microbiological life, influences hydration of salts, and affects stone splitting along with other mechanical disintegration processes. The effect of temperature variations on mechanical weathering is noted. The combined action of temperature and soil moisture is shown to influence pressure gradients in rocks, particularly when salts are present. For the drier parts of the semi-desert (annual rainfall 200-300) some salts and gypsum may be leached during the rainy season without consistent impact on permanent horizon differentiation. The sequence of soil development is Torriothent in extremely dry areas, Calciorthid in the common arid and drier semiarid belts, toward Comborthid in moister semiarid regions. Salorthids and Gypsiothids are related to saline regions. Torripsamments and Torrifluvents represent dune areas and depression zones. Argids are explained by saline-alkaline conditions and a fluctuating groundwater table. (Popkin-Arizona)
W78-08755

RELATIVE MOVEMENT OF BROMIDE AND NITRATE IN SOILS UNDER THREE IRRIGATION SYSTEMS,
Texas A and M Univ., Lubbock. Agricultural Research and Extension Center.
A. B. Onken, C. W. Wendt, R. S. Hargrove, and O. C. Wilke.
Soil Science Society of America, Journal, Vol 41, No 1, p 50-52, 1977. 4 fig, 4 ref.

Descriptors: *Ion transport, *Bromides, *Nitrates, *Soil water movement, *Irrigation practices, Solutes, Sodium compounds, Corn(Field), Sands, Furrow irrigation, Sprinkler irrigation, Subsurface irrigation, Plant growth, Soil profiles, Statistical models, Field tests, Sodium bromide.

The applicability of bromide as an indicator of nitrate movement in soils was tested under field conditions. A mixture of sodium nitrate and sodium bromide was band applied to sweet corn (Zea mays L.) on Miles loamy fine sand. Three irrigation methods: furrow, sprinkler, and subirrigation, were used on the plots. Nitrate and bromide moved together in the soil profile, but concentrations were quantitatively unrelated due to antecedent nitrate-nitrogen, and differential nitrogen and bromide uptake by growing plants. Nitrate and bromide will move similarly in soil under field conditions, though bromide cannot be used to determine quantitative movement of nitrate. Figures show nitrogen and bromide in soil profiles for all three irrigation methods, and regression of nitrate-nitrogen and bromide in soil samples. (Popkin-Arizona)
W78-08756

EXCHANGE CAPACITY OF CALCIUM AND SODIUM SOILS AS DETERMINED BY DIFFERENT REPLACING CATIONS,
Technion-Israel Inst. of Tech., Haifa. Soils and Fertilizers Lab.
I. Ravina, and E. Gurovich.
Soil Science Society of America, Journal, Vol 41, No 2, p 319-322, 1977. 2 fig, 5 tab, 26 ref.

Descriptors: *Cation exchange, *Soil chemical properties, *Cation adsorption, *Ion transport, *Leaching, Organic matter, Calcium, Sodium, Soil types, Polarity, Irrigation water, Loess, Calcareous soils, Organic soils, Arid soils.

Cation-exchange capacity is an important soil chemical property which affects ionic mobility, cation adsorption, ion adsorption, ion exchange, and other phenomena. Three arid land soils (Grumosol, Loess, Terra-rosa), with very low organic matter, were saturated with calcium and leached, and saturated with sodium and leached. Exchange capacities were measured for different cations. Experimental values for cation exchange capacity depended on the initially adsorbed cation and the replacement. The magnitude of exchange capacity increased with increased ionic radius, or polarizability of the replacing cation. The sodium soil showed a greater exchange capacity than the calcium soil. The exchange capacity of a calcium-saturated soil increased as the ionic radium of the replacement cation is larger. The magnitude of exchange capacity of the sodium-saturated soil decreased with increased ionic radius of the replacement cation. This work implies the effect of irrigation with high sodium or calcium water on the exchange capacity of irrigated soils. (Popkin-Arizona)
W78-08757

2H. Lakes

RESERVOIR SEDIMENTATION UNDER UNCERTAINTY: ANALYTIC APPROACH VERSUS SIMULATION,
Water Resources Center, Budapest (Hungary).
For primary bibliographic entry see Field 2J.
W78-08292

PROJECTIONS OF PHOSPHORUS LEVELS IN WHITE LAKE,
Hydroscience, Inc., Westwood, NJ.
For primary bibliographic entry see Field 5C.
W78-08304

LIMNOLOGICAL CHARACTERISTICS AND FISHERY POTENTIAL OF MAN-MADE DESERT PONDS,
Arizona Cooperative Fishery Research Unit, Tucson.
S. R. Alcorn, and C. D. Ziebell.
Journal of the Arizona - Nevada Academy of Science, Vol 13, No 1, p 29-42, June, 1977. 4 tab, 6 ref.

Descriptors: *Limnology, *Aquatic environment, Hydrologic aspects, Ponds, Water properties, Sampling, Water analysis, Aquatic life, Water quality, *Fish establishment, Environmental effects, Aquatic habitats, On-site data collections, *Arizona, Deserts.

Four southern Arizona pump-in ponds and represas were studied to determine the suitability of the water to support fish. Basic parameters included temperature, dissolved oxygen, pH and photic depth. Study conclusions suggested pump-in ponds were most likely to meet the necessary water quality criteria including necessary temperature, dissolved oxygen regimes suitable for fish, water depth of approximately 2.0 m, and absence of excess nutrients. Water quality of represas did not appear conducive to the establishment of fish, due to uncontrollable water levels and the presence of excess nutrients, causing eutrophication. Study of fish food chains is still necessary before a desert fishery can be successfully established. (Jewkes-Arizona)
W78-08356

ZOOGEOGRAPHY OF THE ARIZONA FAIRY SHRIMPS (CRUSTACEA: ANOSTRACA),
Arizona State Univ., Tempe.
D. Belk.
Journal of the Arizona Academy of Science, Vol 12, No 2, p 70-78, June, 1978. 3 fig, 43 ref.

Descriptors: Shellfish, *Shrimp, Crustaceans, *Arizona, Aquatic environment, Arid climates, Water chemistry, Aquatic habitats, On-site data collections, Ponds, Distribution patterns, *Environmental effects, Aquatic population, Wildlife, Water temperature.

Arizona has the most diverse fairy shrimp population of any comparable area in North America, with 13 species of the 35 recorded for all of North America. Arizona's fairy shrimp species were investigated to determine how environmental differences contributed both to species diversity and to geographical distribution. Egg hatching response to different water temperatures, varied responses to thermal tolerance and climatic variations were discussed. Study conclusions suggested regional differences in fairy shrimp species appear to be controlled by climatic variations accompanying temporary pond filling cycles and differences in water chemistry. (Jewkes-Arizona)
W78-08365

BACTERIOLOGICAL STUDIES OF THE MESOTROPHIC LAKE JASNE,
Nicolas Copernicus Univ. of Torun (Poland). Lab. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-08382

PRIMARY PRODUCTION OF THE PLANKTON IN LAKE JEZIORAK,
Nicolas Copernicus Univ. of Torun (Poland). Inst. of Biology.
For primary bibliographic entry see Field 5C.
W78-08383

INTRODUCTORY INVESTIGATIONS ON THE STRATIFICATION OF THE UNDERGROUND ORGANS OF MACROPHYTES IN LAKE JEZIORAK,
Nicholas Copernicus Univ. of Torun (Poland). Dept. of Systematics and Plants Geography.
For primary bibliographic entry see Field 5C.
W78-08384

THE PRODUCTION OF PERIPHYTONIC ALGAE IN LAKE TYNWALD,
Nicolas Copernicus Univ. of Torun (Poland). Inst. of Biology.
For primary bibliographic entry see Field 5C.
W78-08385

DISTRIBUTION, PRODUCTION AND DYNAMICS OF DEVELOPMENT OF THE HELEOCHARIS PALUSTRIS (L.) ROEM. ET SCHULT. IN THE JEZIORAK LAKE,
Nicholas Copernicus Univ. of Torun (Poland). Dept. of Systematics and Plant Geography.
For primary bibliographic entry see Field 5C.
W78-08386

SWIMMERS' ITCH IN NEW BRUNSWICK: DISTRIBUTION AND DESCRIPTION OF CAUSATIVE AGENT, CERCARIA CATASCOPII N.SP.,
New Brunswick Univ., Fredericton. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-08394

DISTRIBUTION AND PRODUCTION OF TWO CRUSTACEANS IN A WETLAND POND,
Georgia Inst. of Tech., Atlanta. School of Biology.
R. F. Martien, and A. C. Benke.
American Midland Naturalist, Vol 98, No 1, p 162-175, 1977. 3 fig, 2 tab, 29 ref.

Descriptors: *Wetlands, *Crustaceans, *Isopods, *Amphipod, *Distribution patterns, *Ponds, Swamps, *Georgia, Aquatic animals, Production, Periphyton, Reproduction, Benthos, Turnover, Crangonyx gracilis, Asellus obtusus, Cephalanthus occidentalis, Nyssa biflora.

Annual production of the isopod, Asellus obtusus, and the amphipod, Crangonyx gracilis sp., in a small wetland pond in Georgia was estimated by the Hynes method. Both species were found in two distinct vegetable zones: a central Cephalanthus occidentalis zone and a marginal Nyssa biflora zone. In the Nyssa zone, the crustaceans occurred in the aufwuchs and benthos, but in the Cephalanthus zone, only in the aufwuchs. Although growth of each species was relatively asynchronous, each appeared to have one generation per year. Combined aufwuchs-benthos production in the Nyssa zone was 2.44 g/sq m dry wt for Crangonyx and 1.44 g/sq m for Asellus. Annual turnover ratios were 6.1 and 6.0, respectively. Aufwuchs production in the Cephalanthus zone was 1.63 g/sq m for Crangonyx and 0.65 g/sq m for Asellus. Annual turnover ratios were 6.8 and 8.1, respectively. Benthos in Nyssa contributed the greatest crusteacean production to this zone based upon standing stock values, but aufwuchs populations were the only significant source of production in the Cephalanthus zone. (Steiner-Mass)
W78-08400

LAGOON OF ISLANDS, TASMANIA--DEATH KNELL FOR A UNIQUE ECOSYSTEM,
Tasmania Univ., Hobart (Australia). Dept. of Botany.
For primary bibliographic entry see Field 6G.
W78-08417

USE OF NATURAL BASIN WETLANDS BY BREEDING WATERFOWL IN NORTH DAKOTA,
Fish and Wildlife Service, Jamestown, ND. Northern Prairie Wildlife Research Center.
H. A. Kantrud, and R. E. Stewart.
Journal of Wildlife Management, Vol. 41, No. 2, p 243-253, April, 1977. 2 fig, 3 tab, 27 ref.

Descriptors: *Waterfowl, *Ducks, *Wetlands, Ponds, *North Dakota, *Prairie potholes, *Breeding waterfowl, Wetland type, Ponded water, Permanence.

Use of basin wetlands by breeding populations of 12 species of waterfowl was investigated in 1965 and during 1967-1969 throughout the prairie pothole region of North Dakota. Data were obtained primarily by random sampling techniques. Of the total population occupying natural basin wetlands, 55 percent occupied seasonal and 36 percent occupied semi-permanent wetlands. Seasonsal wetlands contained 60 percent of the population of dabbling ducks, while semi-permanent wetlands supported 75 percent of the population of diving ducks. On basins with ponded water, highest concentrations of breeding pairs occurred on temporary, seasonal, and semi-permanent wetlands; moderate concentrations were recorded on ephemeral, fen, and undifferentiated tillage wetlands; and low concentrations occurred on permanent and alkali wetlands. The proportion of basins that retained ponded water had a direct bearing on the value of each type of wetland to breeding waterfowl. Relative values of the more intermittent types of wetlands greatly increased during years of ample precipitation. (Stihler-Mass)
W78-08418

TOXIC EFFECTS OF MILITARY WASTEWATER EFFLUENT,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 5C.
W78-08629

2I. Water In Plants

MODELING EFFECTS OF AQUATIC PLANTS IN RIVERS.
Ministry of Works and Development, Hamilton (New Zealand).
For primary bibliographic entry see Field 5C.
W78-08300

WATER MOVEMENT IN BARE AND CROPPED SOIL UNDER ISOLATED TRICKLE EMITTERS: I. ANALYSIS OF BARE SOIL EXPERIMENTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-08313

SOIL MOISTURE EFFECTS ON TRANSPIRATION AND NET CARBON DIOXIDE EXCHANGE OF SORGHUM,
Kansas State Univ., Manhattan. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W78-08362

SOIL WATER CHANGES IN THE CREOSOTEBUSH AND BUR-SAGE DURING A DRY PERIOD IN SOUTHERN ARIZONA,
Rocky Mountain Forest and Range Experiment Station, Flagstaff, AZ.
For primary bibliographic entry see Field 2G.
W78-08368

VEGETATION CHANGE IN THE SONORAN DESERT REGION, ARIZONA AND SONORA,
Forest Service, Fort Collins, CO; and Rocky Mountain Forest and Range Experiment Station, Flagstaff, AZ.
S. C. Martin, and R. M. Turner.
Journal of the Arizona Academy of Science, Vol 12, No 2, p 59-69, June, 1977. 7 fig, 19 ref.

Descriptors: Arizona, Mexico, Vegetation effects, Vegetation regrowth, *Desert plants, Plant populations, Environmental effects, Cacti, *Arid climates, Deserts, *Photography, Succession, Wildlife, Watershed management, Climatology, Rainfall.

Six series of photographs recorded changing vegetation conditions in the Sonoran Desert of Arizona and Sonora, 1906-1975. Some of the vegetational changes noted were due to rainfall variability, including periods of droughts, or periods with above average rainfall. Suggested changes caused by man included: introduction of grazing, fires, poor watershed management, and removal of woody plants. Long-term studies of the relationship between rainfall and vegetation need to be undertaken, but such studies need protected study sites, free from human influence. (Jewkes-Arizona)
W78-08370

COMPARISON OF THE PHOTOSYNTHETIC CHARACTERISTICS OF THREE SUBMERSED AQUATIC PLANTS,
Florida Univ., Gainesville. Dept. of Agronomy.
For primary bibliographic entry see Field 5C.
W78-08376

WATER MOVEMENT IN BARE AND CROPPED SOIL UNDER ISOLATED TRICKLE EMITTERS: II. ANALYSIS OF CROPPED EXPERIMENTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-08392

INCREASING RANGELAND FORAGE PRODUCTION BY WATER HARVESTING,
Agricultural Research Service, Tucson, AZ. Southwestern Watershed Research Center; and Agricultural Research Service, Phoenix, AZ. Water Conservation Lab.
H. A. Schreiber, and G. W. Frasier.
Journal of Range Management, Vol 31, No 1, p 37-40, January, 1978. 2 fig, 2 tab, 11 ref.

Descriptors: *Arizona, *Arid climates, *Forage grasses, *Water supply, Surface runoff, Rainfall-runoff relationships, Plant growth, *Water control, *Water harvesting, *Range management, On-site tests, *Watershed management.

A three year study (1974-1976) was conducted on test plots on the lower Walnut Gulch Watershed, near Tombstone, Arizona, to evaluate the effect of increased water on forage production of blue panicgrass (Panicum antidotale Retz). Available water for plant growth was increased through runoff farming (water harvesting) techniques. Applying paraffin for water repellancy increased water collected in runoff areas. Test yields indicated forage production from controlled plots was 5 times greater than in plots receiving an uninterrupted planting of grass, less than 130mm. (5.1 inches) of precipitation during the growing season. (Jewkes-Arizona)
W78-08399

DISTRIBUTION AND PRODUCTION OF TWO CRUSTACEANS IN A WETLAND POND,
Georgia Inst. of Tech., Atlanta. School of Biology.
For primary bibliographic entry see Field 2H.
W78-08400

EFFECTS OF SALINITY AND DRAINAGE ON THE GROWTH OF THREE SALT MARSH GRASSES,
Louisiana State Univ., Baton Rouge. Dept. of Botany.
R. T. Parrondo, J. G. Gosselink, and C. S. Hopkinson.
Botanical Gazette, Vol 139, No 1, p 102-107, 1978. 2 fig, 3 tab, 30 ref.

Descriptors: *Salt marshes, *Halophytes, *Salt tolerance, *Ecological distribution, Wetlands, Marsh plants, Marshes, Salinity, Productivity, Grasses, *Salt marsh grasses, Spartina alterniflora, Spartina cynosuroides, Distichlis spicata.

Seedlings of Spartina alterniflora, Spartina cynosuroides, and Distichlis spicata were grown in a controlled environment in a nutrient solution containing different concentrations of NaCl. In another experiment, seedlings of S. alterniflora and S. cynosuroides were grown in a greenhouse, in a 50-50 sediment-sand mixture under constantly flooded or drained substrate. Dry-weight accumulations of plants indicated that, of the three species tested, D. spicata was the most tolerant of high salinity. S. alterniflora and S. cynosuroides were similar in their response to salinity, but less tolerant than D. spicata. In general, increasing the salinity of the root medium reduced the shoot growth more than root growth. Roots of S. alterniflora grew better under flooded than drained conditions, while overall growth of S. cynosuroides was better in drained than flooded sediment. These findings are compared to field observations on the relative distribution of these species in the salt marsh, and the relative importance of salinity and flooding in determining plant distribution is briefly discussed. (Steiner-Mass)
W78-08401

SALT TOLERANCE IN THE HALOPHYTE SUAEDA MARITIMA (L.) DUM: INTERACTION BETWEEN ALUMINIUM AND SALINITY,
Sussex Univ., Brighton (England). School of Biological Sciences.
A. R. Yeo, and T. J. Flowers.
Annals of Botany, Vol 41, p 331-339, 1977. 2 fig, 5 tab, 45 ref.

Descriptors: *Halophytes, *Salinity, *Aluminium, Marsh plants, Root development, Productivity, Root systems, *Salt tolerance, *Suaeda maritima.

Growth of Suaeda maritima was stimulated by low aluminum concentrations in saline solution culture with an increase in the number and extent of lateral roots. Under non-saline conditions the same Al concentrations inhibited growth and led to an abnormal lateral root initiation. Increasing the level of Al led to growth inhibition under both culture conditions. Salinity reduced the uptake of Al into plant tissue, and there was no evidence that Al was tolerated internally. Although short-term P32 influx was increased by Al there was no long-term effect of significance on the levels of Na, K, Ca, nor P in the shoots. The results are discussed in relation to proposed mechanisms of Al toxicity and the interaction between Al and salt toxicities. An explanation is proposed for both stimulatory and inhibitory effects of Al as a quantitative expression of a single primary effect upon the root system. (Steiner-Mass)
W78-08402

PRIMARY PRODUCTION IN A LOUISIANA GULF COAST SPARTINA ALTERNIFLORA MARSH,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
C. J. Kirby, and J. G. Gosselink.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 589, Price codes: A02 in paper copy, A01 in microfiche.
Ecology, Vol 57, No 5, p 1052-1059, Late summer, 1976. 3 fig, 3 tab, 21 ref.

Descriptors: *Primary productivity, *Coastal marshes, *Saltmarsh, *Louisiana, Marshes, Wetlands, *Biomass, *Spartina laterniflora, Aboveground biomass, *Barataria Bay(La).

Live and dead aboveground biomass of Spartina alterniflora Loisel in a Louisiana salt marsh was determined monthly over an annual cycle. Litterbags were used to determine loss rates of particulate vegetation from the marsh surface. Net aboveground primary production estimates ranged from 750 to 2,600 g/sq m/yr depending on how the data were handled. Analysis of the results suggested that true net production was probably much closer to the highest estimate than to the lowest. (Stihler-Mass)
W78-08404

EFFECT OF DEFOLIATION ON ROOT GROWTH OF SOME ARID ZONE PERENNIAL PLANTS,
Commonwealth Scientific and Industrial Research Organization Wembley (Australia). Div. of Land Resources Management; and Commonwealth Scientific and Industrial Research Organization Canberra (Australia). Div. of Land Resources Management.
K. C. Hodgkinson, and H. G. Baas Becking.
Australian Journal of Agricultural Research, Vol 29, No 1, p 31-42, January, 1978. 13 fig, 1 tab, 25 ref.

Descriptors: *Australia, *Plant growth, Plant growth regulators, *Plant physiology, *Root development, Plant morphology, Vegetation, *Desert plants, Defoliants, *Arid lands, *Grasses, Growth rate, *On-site tests, Evaluation, *Alfalfa.

Experiments compared the effect of defoliation on the root growth of three perennial plants: wallaby grass (Danthonia caespitosa), old man saltbush (Atriplex nummularia), and bladder saltbush (A. vesicaria) with lucerne (Medicago sativa). lucerne (Medicago sativa) is not. Longterm effects, up to 3 days after defoliation, were studied in root observation boxes outdoors. Responses of roots to defoliation were recorded by use of time-lapse photography. Tests suggested that rate of root extension of the Atriplex spp was approximately double that of M. sativa and D. caespitosa. Severity of defoliation reduced rate of root extension, increasing root mortality and decreasing the branching of roots, After complete defoliation, root extension of D. caespitosa showed signs of slowing down within an hour, while root extension of A. nummularia and M. sariva toolk 12 to 14 hours for a decrease in root extension. (Jewkes-Arizona)
W78-08408

DIURNAL ALBEDO VARIATION OF BLACK SPRUCE AND SPHAGNUM-SEDGE BOGS,
Oregon State Univ. Extension Service, Corvallis.
For primary bibliographic entry see Field 2D.
W78-08414

ABOVE-GROUND BIOMASS OF VASCULAR PLANTS IN A SUBARCTIC JAMES BAY SALT MARSH,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2L.
W78-08416

LAGOON OF ISLANDS, TASMANIA--DEATH KNELL FOR A UNIQUE ECOSYSTEM,
Tasmania Univ., Hobart (Australia). Dept. of Botany.
For primary bibliographic entry see Field 6G.
W78-08417

USE OF NATURAL BASIN WETLANDS BY BREEDING WATERFOWL IN NORTH DAKOTA,
Fish and Wildlife Service, Jamestown, ND. Northern Prairie Wildlife Research Center.
For primary bibliographic entry see Field 2H.
W78-08418

STUDIES ON THE POPULATION ECOLOGY OF THE SALT MARSH GASTROPOD BATILLARIA ZONALIS,
University of the Pacific, Dillon Beach, CA. Pacific Marine Station.
For primary bibliographic entry see Field 2L.
W78-08419

THE USE OF AERIAL COLOR INFRARED PHOTOGRAPHY IN MAPPING THE VEGETATION OF A FRESHWATER MARSH,
American Univ., Washington, DC. Dept. of Biology.
L. J. Shima, R. R. Anderson, and V. P. Carter.
Chesapeake Science, Vol. 17, No. 2, p 74-85, June, 1976. 4 fig, 2 tab, 25 ref.

Descriptors: *Aerial photography, *Infrared radiation, *Mapping, *Vegetation, *Freshwater marshes, *Remote sensing, Plant groupings, Color infrared photography, *Patuxent River(Md), *Maryland.

Spring and fal vegetation maps were prepared from a freshwater marsh on the Patuxent River, Maryland. Low altitude, color infrared (IR) aerial photos were correlated with data obtained from field surveys. The vegetation units mapped refer to areas of homogenous color on the photos. These areas of homogenous color represent species associations or monospecific stands which produce a distinctive tonal signature. Color fluctuations within an area having a distinctive tonal signature are primarily caused by a quantitative variation of plant species but are also related to the growth habit, vigor of the plant species, and environmental conditions which affect the vegetation and in turn the color of the recorded image. Changes in the color over the growing season reflect plant successions were due to their unique colors, saturations, and textures. Comparisons of photographs made in nearby marshes demonstrated that three of the twelve spring, and five of the fourteen fall vegetation units were mapped can be reliably indentified. (Maroncelli-Mass)
W78-08421

WATER REQUIREMENTS OF AVOCADO IN ISRAEL, II. INFLUENCE ON YIELD, FRUIT GROWTH AND OIL CONTENT,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
For primary bibliographic entry see Field 3F.
W78-08422

FIELD OBSERVATIONS ON THE COLONIZATION OF NEW SUBSTRATA AND DENUDED INTERTIDAL SURFACES BY BENTHIC MACROPHYTIC ALGAE,
Dar es Salaam Univ. (Tanzania). Dept. of Botany.
K. E. Mshigeni.
Botanica Marina, Vol 21, p 49-57, 1978. 11 fig, 3 tab, 4 ref.

Descriptors: *Benthic flora, *Algae, *Sessile algae, *Plant populations, *Hawaii, *Vegetation establishment, *Revegetation, Aquatic plants, Planting management, Reproduction, *Hypnea, *Acanthophora.

Investigations have been conducted on the colonization of new substrata (brick surfaces) and recolonization of denuded intertidal surfaces by frondose benthic algae on the tropical shores of Hawaii. The bricks were 'seeded' with Hypnea cervicornis sporelings and several other species of frondose algae grew on the bricks from spores or vegetative fragments. Heights of the fronds varied from about 8 to 48 mm at two months after transfer of bricks to the field. Heights of the conspicuous frondose algae recolonizing the denuded habitat at Diamond Head two months after crop destruction ranged from about 10 to 30 mm. Results of the study suggest that algae such as Acanthophora spicifera and Hypnea nidifica can propagate vegetatively which is significant should these seaweeds be cultivated for phycocolloid production or other uses. (EIS-Katz)
W78-08660

SEASONAL MOVEMENTS OF WHITE STURGEON (ACIPENSER TRANSMONTANUS) IN THE MID-COLUMBIA RIVER,
Battelle Pacific Northwest Labs., Richland, WA. Ecosystems Dept.
J. M. Haynes, R. H. Gray, and J. C. Montgomery.
Transactions of the American Fisheries Society, Vol 107, No. 2, p 275-280, 1978. 3 fig, 1 tab, 12 ref.

Descriptors: *Freshwater fish, *Seasonal, *Fish behavior, Movement, *Radio Communication Systems, Migration, Rivers, *Columbia River, Tracking techniques, Locating, Tagging, Research and development, Methodology, *Water temperature, *White sturgeon, Radio transmitters, Acipenser transmontanus.

Twenty-nine white sturgeon were instrumented in 1975 and 1976 with separately identifiable radio transmitters to study seasonal movements in the mid-Columbia River, southeastern Washington. Tagged fish remained in free-flowing areas of the river and were inactive in winter. Movements occurred in summer and early fall. Activity appeared related to water temperature and sturgeon size. (EIS-Klein)
W78-08677

ROOT SYSTEM OF SHRUB LIVE OAK IN RELATION TO WATER YIELD BY CHAPARRAL,
Rocky Mountain Forest and Range Experiment Station, Tempe, AZ. Forestry Sciences Lab.
For primary bibliographic entry see Field 3B.
W78-08734

PRELIMINARY EXPERIMENTS ON THE GROWTH OF KENAF (HIBISCUS CANNABINUS) FOR PAPER PULP PRODUCTION IN THE ORD IRRIGATION AREA, WESTERN AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, St. Lucia (Australia). Div. of Tropical Agronomy.
For primary bibliographic entry see Field 3F.
W78-08738

LONG-TERM BIOMASS DYNAMICS IN AN ARID CHENOPOD SHRUB COMMUNITY AT KOONAMORE, SOUTH AUSTRALIA,
Australian National Univ., Canberra. Dept. of Environmental Biology.
I. R. Noble.
Australian Journal of Botany, Vol 25, No 6, p 639-653, December, 1977. 8 fig, 1 tab, 30 ref.

Descriptors: *Australia, Arid climates, Vegetation, Photography, *Rainfall, *Biomass, Shrubs, *Desert plants, On-site investigations, Hydrologic data, *Sampling, Brush control, Evaluation, Vegetation establishment, Environmental effects, Revegetation, Forages.

The Koonamore Vegetation Preserve in South Australia has maintained records of vegetation for over 50 years. This study presents a method of estimating biomass from long-term, non-rigorously controlled photo-points. Changes in biomass were correlated with rainfall, suggesting that short-leved shrubs' growth pattern is accelerated by summer rains. Biomass dynamics for all species studied showed a pattern of large input impulses, followed by a slow decline in biomass. Study conclusions confirm the average above-ground biomass and productivity for the plant community studied was c. 90 gm-2yr-1 respectively, due in part to the presence of short-lived plants. The influence of grazing industry upon short-lived plants and shrubs is described. (Jewkes-Arizona)
W78-08747

RECOMMENDED DROUGHT AND SALT-RESISTANT ORNAMENTAL PLANTS,
Ben-Gurion Univ. of the Negev, (Beersheba (Israel). Div. of Plant Introduction and Applied Ecology.
For primary bibliographic entry see Field 3B.
W78-08752

2J. Erosion and Sedimentation

BASIN DYNAMICS, CHANNEL PROCESSES, AND PLACER FORMATION: A MODEL STUDY,
Victoria Univ., Wellington (New Zealand).
J. Adams, G. L. Zimpfer, and C. F. McLane.
Economic Geology, Vol 73, No 3, p 416-426, May 1978. 9 fig, 28 ref.

Descriptors: *Placer mining, *Alluvial channels, *Channel morphology, *Model studies, Scour, Sediment transport, Aggradation, Sediment yield, Hydraulic models, Watersheds(Basins), Mining, Mineralogy, Erosion, Braiding, Streams, Testing procedures, Analysis, Laboratory tests, Heavy minerals, Magnetite.

The problems of the role of basin dynamics, tectonics, and channel processes in the formation of placers has not been well understood. These problems were investigated in a miniature drainage basin subjected to rejuvenation. Sediment samples collected during the experiment showed the response of total sediment discharge and heavy mineral discharge to rejuvenation. Total sediment yield peaked shortly after rejuvenation began and then decayed exponentially. This decay does not characterize magnetite yield which was produced in discrete events separated by periods of little output. Samples within the source area indicated that magnetite was concentrated and stored on uplands and hillslopes as well as in the floodplain. Valley fill contained horizontal layers deposited as the channel shifted laterally and trough-shaped scour and fill deposits, which marked former channel courses. Within these deposits magnetite was concentrated on bedrock channel bottoms, on alluvial channel bottoms ('false bottoms'), and in similar positions within terrace deposits. Complex response dominates basin rejuvenation. Initially, placers are destroyed and transported from the basin. Aggradation then overloads channels and heavy minerals are stored. This is succeeded by degradation during which heavy minerals are concentrated and flushed from the basin. Superimposed upon this complex response are shorter periods of heavy mineral transport and storage controlled by internal geomorphic thresholds. In both cases, heavy mineral transport is controlled directly by channel activity. Storage occurs when the channel aggrades; and when the channel degrades, heavy minerals are concentrated in the channels and transported from the basin. (Humphreys-ISWS)
W78-08273

RESERVOIR SEDIMENTATION UNDER UNCERTAINTY: ANALYTIC APPROACH VERSUS SIMULATION,
Water Resources Center, Budapest (Hungary).
I. Bogardi, L. Duckstein, F. Szidarovszky, and M. Fogel.
Hydrological Sciences Bulletin, Vol. 22, No. 4, p 545-553, December 1977. 2 fig, 1 tab, 25 ref.

Descriptors: *Reservoir silting, *Sediment yield, *Reservoirs, Reservoir storage, Reservoir yield, *Risks, Reliability, Simulation analysis, Hydrology, Equations, Mathematics, Mathematical studies, *Uncertainty, Reservoir sedimentation.

Two methods were presented of estimating accumulated sediment yield stemming from erosion in a semiarid climate during a given time span, and the methods were compared from the viewpoint of the economic consequences evaluated within a Bayesian framework. The design of reservoirs requires the estimation of the random sediment volume Z accumulated over the lifetime of the project. An analytic and a simulation method were used to estimate the density function of Z and to calculate an economically optimal sediment storage space. A case study in Arizona was used to illustrate the methodology for the typical situation when only rainfall records are available. Both methods proved to be superior to the traditional procedure leaning on mean values. For the example considered, the two methods yielded commensurate results. It appears that, in a semiarid basin, the effect of parameter uncertainty on both random accumulated sediment volume and optimal sediment storage space may be considerably higher than that of natural uncertainty. (Lee-ISWS)
W78-08292

EROSION OF COHESIVE SOILS,
Stuttgart Univ. (West Germany). Inst. fuer Theoretische und Angewandte Physik.
J. Lambermont, and G. Lebon.
Journal of Hydraulic Research, Vol. 16, No. 1, p 27-44, 1978. 4 fig, 11 ref.

Descriptors: *Erosion, *Cohesive soils, *Turbulent flow, *Boundary processes, Shear stress, Sediment distribution, Bed load, Model studies, Mathematics, *Erosion flux, Cohesive sediment bed, Density distribution.

The erosion of visco-plastic cohesive soils under the action of a turbulent fluid flow was studied. The equations describing a sediment bed were discussed. To solve the equations, the density distribution in the bed must be known at some initial time. Experimental field studies and results from the ultracentrifuge provide a clear picture of the density distribution in sediment layers. The boundary condition between the bed-fluid interface was obtained from experimental observations. It was inferred that the instantaneous physico-chemical composition at the top of the bed is uniquely related to the bed shear stress during erosion. The solution for the stationary erosion flux under a constant shear stress was obtained. The erosion flux depends on the properties of the bed and the shear stess induced by the turbulent fluid flow. The theory was shown to agree very well with the experiments performed by Partheniades (1965). (Singh-ISWS)
W78-08294

CHANNEL EROSION IN SOUTHWESTERN LOUISIANA CANAL,
California Univ., Los Angeles. Dept. of Geography.
L. N. Doiron, and C. A. Whitehurst.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol 104, No WW2, Proceedings Paper 13772, p 201-213, May 1978. 10 fig, 2 tab, 20 ref.

Descriptors: *Bank erosion, *Aerial photography, Banks, Canals, Channel morphology, Channels, Erosion, Scour, Inland waterways, Stream erosion, Sediments, Suspended sediments, Vegetation effects, Navigable waters, *Trainasses, *Geologic processes, Tidal currents.

Geomorphic processes active in the man-made Southwestern Louisiana Canal were studied with the aid of color infrared and multiband imagery aerial phiotography and various field analysis techniques. The enlargement and shoaling of the canal were investigated to determine their causes and to quantify the rates of erosion and deposition in a man-made structure of historically known dimensions in the bi-directional tidal flow regions of an estuarine environment. (Roberts-ISWS)
W78-08298

EROSIONAL REMOVAL OF FALLOUT PLUTONIUM FROM A LARGE MIDWESTERN WATERSHED,
Argonne National Lab., IL. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 4D.
W78-08549

PERTINENT CRITERIA FOR DESCRIBING THE DISSOLUTION OF GYPSUM BEDS IN FLOWING WATER,
Georgia Coastal Plain Experimental Station, Tifton, Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W78-08558

STOCHASTIC PREDICTION OF SEDIMENT YIELDS FROM STRIP MINE SPOILS OF THE ARID SOUTHWEST,
Arizona Univ., Tucson. School of Renewable Natural Resources.
M. E. Auernhamer, M. M. Fogel, L. H. Hekman, and J. L. Thames.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 7. Proceedings, Meetings of the American Water Resources Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, April 15-16, 1977, Las Vegas, Nevada, p. 33-40, 5 fig, 1 tab.

Descriptors: Erosion, Precipitation(Atmospheric), *Sediment yield, Erosion control, *Erosion rates, *Hydrologic data, *Mathematical models, *Land reclamation, Arizona, Watershed management, Stochastic processes, Coal mine wastes, Spoil banks.

Mathematical simulation of the erosion process is accomplished by using a time series of hydrologic parameters in a modified form of the universal soil loss equation. A parameter to account for antecedent moisture conditions improved the predictive success of the equation. The simulation predicts sediment yield from a stochastic sequence of precipitation events on an experimental watershed. This sediment model will be used as a component in a larger, more complex hydrologic simulation for use in determining optimum reclamation practices for strip mined areas in the arid southwest. Data from regarded strip mine spoils at the Black Mesa of Arizona are used in calibrating the model.
W78-08729

PROCEEDINGS OF THE NATIONAL SYMPOSIUM ON SOIL EROSION AND SEDIMENTATION BY WATER.
American Society of Agricultural Engineers, St. Joseph, MI.
For primary bibliographic entry see Field 4D.
W78-08787

SOIL EROSION AND SEDIMENTATION BY WATER--AN OVERVIEW,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4D.
W78-08788

CURRENT SOIL EROSION AND SEDIMENT CONTROL TECHNOLOGY FOR RURAL AND URBAN LANDS,
Soil Conservation Service, Washington, DC.
For primary bibliographic entry see Field 4D.
W78-08789

POLITICAL, SOCIAL, AND ECONOMIC ASPECTS OF SOIL EROSION AND SEDIMENTATION CONTROL PROGRAMS,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 6E.
W78-08790

PREDICTING SOIL EROSION,
Soil Conservation Service, Washington, DC.
For primary bibliographic entry see Field 4D.
W78-08791

PREDICTING SEDIMENT YIELDS,
Agricultural Research Service Morris, MN. North Central Soil Conservation Research Center.
For primary bibliographic entry see Field 4D.
W78-08792

ESTABLISHING SOIL LOSS AND SEDIMENT YIELD LIMITS FOR AGRICULTURAL LAND,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 4D.
W78-08793

SEDIMENTATION AND EROSION CONTROL IMPLICATIONS FOR WATER QUALITY MANAGEMENT,
Environmental Research Lab., Athens, GA. Technology Development and Applications Branch.
For primary bibliographic entry see Field 4D.
W78-08794

VEGETATIVE WATER EROSION CONTROL FOR AGRICULTURAL AREAS,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
For primary bibliographic entry see Field 4D.
W78-08795

MECHANICAL EROSION CONTROL FOR AGRICULTURAL AREAS,
Soil Conservation Service, Lincoln, IL.
For primary bibliographic entry see Field 4D.
W78-08796

PROBLEMS OF IMPLEMENTING EROSION CONTROL,
Iowa Soil Conservation Committee, Waterville.
For primary bibliographic entry see Field 4D.
W78-08797

EROSION AND SEDIMENT CONTROL IN URBANIZING AREAS,
Soil Conservation Service, College Park, MD.
For primary bibliographic entry see Field 4D.
W78-08798

EROSION AND SEDIMENT CONTROL FOR COAL SURFACE MINE AREAS,
Washington Irrigation and Development Co., Centralia.
For primary bibliographic entry see Field 4D.
W78-08799

EROSION AND SEDIMENTATION ON IRRIGATED LANDS,
Agricultural Research Service, Kimberly, ID. Snake River Conservation Research Center.
For primary bibliographic entry see Field 4D.
W78-08800

2K. Chemical Processes

A NEW APPROACH TO 'HIGH SOLIDS' SAMPLE INTRODUCTION FOR FLAME ATOMIC ABSORPTION ANALYSIS,
Arizona Univ., Tucson. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-08223

DEVELOPMENT OF A SYSTEM FOR CONDUCTING INTERLABORATORY TESTS FOR WATER QUALITY AND EFFLUENT MEASUREMENTS,
FMC Corp., San Jose, CA. Advanced Products Div.
For primary bibliographic entry see Field 5A.
W78-08227

EFFLUENT MONITORING PROCEDURES: BASIC LABORATORY SKILLS - STUDENT REFERENCE MANUAL,
Charles County Community Coll., La Plata, MD.
For primary bibliographic entry see Field 5A.
W78-08233

OXYGEN CONSUMPTION AT THE SOIL-WATER INTERFACE IN A DELAWARE SALT MARSH,
Delaware Univ., Newark. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2L.
W78-08403

TESTSETS FOR THE QUANTITATIVE ANALYSIS OF AQUEOUS SOLUTIONS WITH PERMANENT INDICATION (TESTSETS FUR DIE QUANTITATIVE ANALYSE WAESSRIGER LOESUNGEN MIT BLEIBENDER ANZEIGE),
For primary bibliographic entry see Field 5A.
W78-08467

THE NBS PROGRAM FOR STANDARDS FOR TRACE ORGANIC ANALYSIS IN THE MARINE ENVIRONMENT,
National Bureau of Standards, Washington, D.C. Analytical Chemistry Div.
For primary bibliographic entry see Field 5A.
W78-08536

THE NBS PROGRAM FOR STANDARDS FOR TRACE INORGANIC ANALYSIS IN THE MARINE ENVIRONMENT,
National Bureau of Standards, Washington, D.C. Analytical Chemistry Div.
For primary bibliographic entry see Field 5A.
W78-08537

THE HARMONIZATION OF THE MONITORING OF THE QUALITY OF INLAND FRESH WATER,
Department of the Environment, London (England).
For primary bibliographic entry see Field 5A.
W78-08548

THEORETICAL MODELING OF MIXED-ELECTROLYTE SOLUTION FLOWS FOR UNSATURATED SOILS,
Agricultural Research Organization, Bet Dagan (Israel). Div. of Soil Physics.
For primary bibliographic entry see Field 2G.
W78-08563

A SOIL COLUMN TENSION LYSIMETER THAT MINIMIZES EXPERIMENTAL EDGE EFFECTS,
Dartmouth Coll., Hanover, NH. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2G.
W78-08565

HYDROGEOLOGY OF THE MEDICINE HAT AREA, ALBERTA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 4B.
W78-08580

SPECTROGRAPHIC ANALYSIS OF WASTE WATER (ANALISIS ESPECTROGRAFICO DE AGUAS RESIDUALES),
Junta de Energia Nuclear, Madrid (Spain). Div. de Quimicay Medio Ambiente.
For primary bibliographic entry see Field 5A.
W78-08616

NATURE AND IMPACT OF TEMPERATURE AND MOISTURE IN ARID WEATHERING AND SOIL FORMING PROCESSES - A REVIEW.
Ghent Rijksuniversiteit (Belgium). Lab. for Physical Geography and Pedology.
For primary bibliographic entry see Field 2G.
W78-08755

RELATIVE MOVEMENT OF BROMIDE AND NITRATE IN SOILS UNDER THREE IRRIGATION SYSTEMS,
Texas A and M Univ., Lubbock. Agricultural Research and Extension Center.
For primary bibliographic entry see Field 2G.
W78-08756

EXCHANGE CAPACITY OF CALCIUM AND SODIUM SOILS AS DETERMINED BY DIFFERENT REPLACING CATIONS,
Technion-Israel Inst. of Tech., Haifa. Soils and Fertilizers Lab.
For primary bibliographic entry see Field 2G.
W78-08757

THE EFFECTS OF PRECIPITATION ON AQUATIC AND TERRESTRIAL ECOSYSTEMS: A PROPOSED PRECIPITATION CHEMISTRY NETWORK, DEPT. OF ENVIRONMENTAL SCIENCES.
Virginia Univ., Charlottesville.
For primary bibliographic entry see Field 5C.
W78-08762

2L. Estuaries

APPLICATION OF REMOTE SENSING TO THE CHESAPEAKE BAY REGION: VOLUME 1 - EXECUTIVE SUMMARY.
National Aeronautics and Space Administration, Greenbelt, MD. Goodard Space Flight Center.
For primary bibliographic entry see Field 5A.
W78-08232

A QUANTITATIVE STUDY OF THE DIFFUSE SOURCE LOADINGS OF CHESAPEAKE BAY, (PROGRESS REPORT),
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 5B.
W78-08234

MONITORING WATER QUALITY BY REMOTE SENSING,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 5A.
W78-08257

MODELING TECHNIQUES FOR ESTIMATING FECAL COLIFORMS IN ESTUARIES,
Oregon State Univ., Corvallis. Dept. of Food Science and Technology.
For primary bibliographic entry see Field 5B.
W78-08278

NON-TIDAL VARIABILITY IN THE CHESAPEAKE BAY AND POTOMAC RIVER: EVIDENCE FOR NON-LOCAL FORCING,
Johns Hopkins Univ., Baltimore, MD. Chesapeake Bay Inst.
D. P. Wang, and A. J. Elliot.
Journal of Physical Oceanography, Vol 8, No 2, p 225-232, March 1978. 11 fig, 1 tab, 8 ref. NSF OCE74-08463.

Descriptors: *Water levels, *Estuaries, *Winds, *Chesapeake Bay, *Potomac River, On-site investigations, On-site data collections, Data processing, Variability, Fluctuations, Waterlevel fluctuations, Sea level, Weather, Atmosphere, Currents(Water), Mathematical models, Model studies, Non-local forcing, Non-tidal water variability.

Non-tidal variability in the Chesapeake Bay and Potomac River, and its relation to atmospheric forcing, was examined from two-month sea level and bottom current measurements. The dominant sea level fluctuations in the Bay had a period of 20 days, and were the result of up-Bay propagation of coastal sea level fluctuations generated by the alongshore winds. Consequently, water was driven out of the Bay by the northward/up-Bay wind and driven into the Bay by the southward/down-Bay wind, through the coastal Ekman flux. There were also large sea level fluctuations at periods of 5 and 2.5 days. The 5-day fluctuations were driven by both the coastal sea level changes and the local lateral winds (Ekman effect). The 2.5-day fluctuaitons were seiche oscillations driven by the local longitudinal winds. In the Potomac River, the sea level fluctuations were induced non-locally by motions in the Bay; the associated volume fluxes appeared to have been confined to the upper layer. The near-bottom currents were driven mainly by the surface slopes which were also set up non-locally by the longitudinal wind over the Bay. In general, the near-bottom current and sea level/volume flux fluctuations were not coherent. A notable exception, however, was found for the 2.5-day fluctuations, which were vertically coherent and showed significant upward phase propagation. (Sims-ISWS)
W78-08299

HYDROLOGIC AND ECOLOGIC INVENTORIES OF THE COASTAL WATERS OF WEST HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
E. A. Kay, R. H. F. Young, L. S. Lau, E. D. Stroup, and S. J. Dollar.
Technical Report No. 105, Water Resources Research Center, April 1977. (SEA Grant Cooperative Report) 94 p, 35 fig, 21 tab.

Descriptors: *Water resources, *Management, *Projects, *Coastal waters, *Hawaii, Hydrology, Ecology, Inventories, Oceanography, Biology, Data collections, Evaluation, *Effects, *Groundwater, *Discharge(Water), Coastal areas, Wave energy, Bays, Planning, Methodology, Monitoring.

The goal of this project was to provide information to the County of Hawaii and to the state for the intelligent management of the marine and coastal resources of West Hawaii, particularly the South Kohala and North Kona areas. This was accomplished through compilation of inventories of biological, hydrological, and some oceanographic data for four selected sites: Pauko, Waiulua, 'Anaeho'omalu, and Kiholo bays. Evaluation was made of existing hydrologic, geologic, oceanographic, and ecologic data in order to determine the volume and influence of groundwater discharge to coastal areas as well as the biological community structure in the near-shore waters. Research results have yielded a classification of the bays according to wave energy and groundwater intrusion. Poor circulation and high groundwater intrusion result in turbid conditions with communities of low diversity--a coastal situation suitable perhaps for a small boat harbor or marina, but undesirable for a marine park or preserve. These results provided an excellent reference point for planning the use or development of the study sites or areas of related hydrologic and ecologic conditions. The methodology and techniques employed can be adapted for monitoring other coastal zone sites in the state. (Graf-Cornell)
W78-08311

PREEMPTION AND THE ROLE OF STATE LEGISLATION IN THE COASTAL ZONE,
McCutchen, Black, Verleger and Shea, Los Angeles, CA.
For primary bibliographic entry see Field 6E.
W78-08330

FLORIDA KEYS COASTAL ZONE MANAGEMENT STUDY.
Florida Dept. of Natural Resources, Tallahassee. Coastal Coordinating Council.
For primary bibliographic entry see Field 6B.
W78-08331

COASTAL ZONE MANAGEMENT,
For primary bibliographic entry see Field 6E.
W78-08333

COASTAL ZONE LAW AND POLICY,
Washington Univ., Seattle. School of Law.
For primary bibliographic entry see Field 6E.
W78-08338

WETLANDS CONTROVERSY: A COASTAL CONCERN WASHES INLAND,
For primary bibliographic entry see Field 6E.
W78-08342

A LEGISLATIVE-POLITICAL HISTORY OF THE COASTAL ZONE MANAGEMENT ACT OF 1972,
Wisconsin Univ.-Madison. School of Law.
For primary bibliographic entry see Field 6E.
W78-08355

PRELIMINARY LEGAL CONSIDERATIONS IN DEVELOPING ARTIFICIAL REEFS,
Texas A and M Univ., College Station. Dept. of Management.
For primary bibliographic entry see Field 6E.
W78-08357

MANAGEMENT OF BOTTOM SEDIMENTS CONTAINING TOXIC SUBSTANCES: PROCEEDINGS OF THE SECOND U.S.-JAPAN EXPERTS' MEETING--OCTOBER 1976, TOKYO, JAPAN.
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5G.
W78-08359

ECOLOGIC STRESS IN A SUBTROPICAL COASTAL LAGOON: LAKE ST. LUCIA, ZULULAND,
California Univ., Los Angeles. Dept. of Geography.
For primary bibliographic entry see Field 5C.
W78-08380

EFFECTS OF SALINITY AND DRAINAGE ON THE GROWTH OF THREE SALT MARSH GRASSES,
Louisiana State Univ., Baton Rouge. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W78-08401

SALT TOLERANCE IN THE HALOPHYTE SUAEDA MARITIMA (L.) DUM: INTERACTION BETWEEN ALUMINIUM AND SALINITY,
Sussex Univ., Brighton (England). School of Biological Sciences.

For primary bibliographic entry see Field 2I.
W78-08402

OXYGEN CONSUMPTION AT THE SOIL-WATER INTERFACE IN A DELAWARE SALT MARSH,
Delaware Univ., Newark. Dept. of Biological Sciences.
J. L. Gal[illegible]her, and F. C. Daiber.
Chesap[illegible] Science, Vol 15, No 2, p 248-250, Decem[illegible]74. 1 fig, 1 tab, 10 ref.

Desc[illegible] *Earth-water interfaces, *Salt mars[illegible] Delaware, Seasonal, *Oxygen consump[illegible] easurement, Soils.

Oxygen consumption at the soil-water interface in a Delaware salt marsh was measured over the annual cycle. No significant difference between vegetation areas was detected, but summer rates were 2.5 times those in winter. Oxygen uptake by the cores of soil was relatively constant with seasonal temperature trends from 2C to 20C, but increased rapidly when the temperature rose to 30C. (Maroncelli-Mass)
W78-08403

PRIMARY PRODUCTION IN A LOUISIANA GULF COAST SPARTINA ALTERNIFLORA MARSH,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 2I.
W78-08404

ANALYSIS OF ESTUARINE SOIL GRADIENTS IN SALT MARSHES OF THE SOUTHWESTERN NETHERLANDS WITH SPECIAL REFERENCE TO THE SCHELDT ESTUARY,
Delta Inst. for Hydrobiological Research, Yerseke (Netherlands).
For primary bibliographic entry see Field 5A.
W78-08407

STANDING CROPS OF FISHES OF AN ESTUARINE AREA IN SOUTHWEST LOUISIANA,
Louisiana Wildlife and Fisheries Commission, Grand Chenier.
W. G. Perry.
Presented at the 30th Annual Meeting, Southeastern Association of Game and Fish Commissioners, October 24-27, 1976, Jackson, Mississippi, 10 p. 4 fig, 5 tab, 14 ref.

Descriptors: *Estuaries, *Fish, *Standing crops, Rotenone, Louisiana, Mullets, Sampling, Anchovies, Menhaden, Red drum, Trawls.

Standing crop of estuarine fisheries, as determined by extensive rotenone sampling, ranged from 17.6 to 1,605 kg/ha; overall average was 393.8. The most abundant species in numbers were gulf menhaden, Brevortia patronus (54.6%); anchovies, Anchoa sp. (10.7%); and striped mullet, Mugil cephalus (6.6%). Of the 8,322 kg of fish collected during the study, red drum, Sciaenops ocellata, represented 32.2%, followed by menhaden (16%) and striped mullet (11.5%). First day rotenone samples were not sufficient for quantitating species abundance. Rotenone collections indicated that trawls were highly slective (P<.01). It is suggested that rotenone and trawling be used as complements in estuarine inventories. (Moroncelli-Mass)
W78-08409

ORGANOCHLORINE PESTICIDE AND POLYCHLORINATED BIPHENYL RESIDUES IN SELECTED FAUNA FROM A NEW JERSEY SALT MARSH---1967 VS. 1973,
Iowa Cooperative Wildlife Research Unit, Ames.
For primary bibliographic entry see Field 5G.
W78-08411

SPECIES COMPOSITION, STANDING STOCK, AND NET PRIMARY PRODUCTION OF A SALT MARSH COMMUNITY IN MISSISSIPPI,
Mississippi Univ., Mississippi State, Dept. of Biology.
B. C. Gabriel, and A. A. de la Cruz.
Chesapeake Science, Vol. 15, No. 2, p 72-77, June, 1974. 3 fig, 4 tab, 12 ref.

Descriptors: *Salt marshes, *Standing crops, Biomass, *Primary productivity, Seasonal, *Mississippi, *Species composition, Harvest method, *St. Louis Bay Estuary(Miss).

Square meter quadrat samples harvested monthly during 1971 to 1972 provided data on the species composition, standing stock, and net primary aerial production of a salt marsh community in St. Louis Bay Estuary, Mississippi. Although a total of 34 species of marsh plants were identified, Juncus roemerianus, Spartina cynosuroides, Scirpus americanus and Distichlis spicata were the most dominant in all the quadrats sampled. Maximum biomass of alive, dead, and partially decayed plants were observed in July, August and January, respectively. Community annual net production estimated by harvest method was 1051 g dry wt sq/m or 5012 ash-free Kcal sq/m. Total biomass obtained by reharvesting previously clipped quadrats in various ages of regrowth revealed a seasonal pattern of growth rate with a maximum during late summer and a productivity estimation of 1108 g dry wt sq/m or 5541 ash-free Kcal sq/m. (Maroncelli-Mass)
W78-08413

ABOVE-GROUND BIOMASS OF VASCULAR PLANTS IN A SUBARCTIC JAMES BAY SALT MARSH,
Canada Centre for Inland Waters, Burlington (Ontario).
W. A. Glooschenko.
Canadian Field-Naturalist, Vol. 92, No. 1, p 30-37, January-March, 1978. 3 fig, 2 tab, 20 ref.

Descriptors: *Biomass, *Rooted aquatic plants, *Subarctic, *Primary productivity, Marshes, Aquatic plants, *Canada, Coastal marshes, Wetlands, *James Bay(Ontario), Vegetation zones.

Vegetation studies including determination of species composition and cover were made along a transect in a subarctic salt marsh located on the southwestern coast of James Bay, Ontario, Canada. Eight vegetation zones were recognized from an intertidal colonization area dominated by Puccinellia phryganodes to the edge of a willow thicket at the landward end of the marsh complex. In each zone, above-ground biomass of vascular plants was determined by clipping at the time of peak biomass. Values ranged from an estimated low of 29 g/sq m dry weight on gravel beach ridges and 157 g/sq m in the mid-marsh to a high of 569 g/sq m in the zone nearest the willow thicket, which was dominated by Juncus balticus. A weighted-mean above-ground biomass for the transect, taking into account the biomass and width of these zones, was 357 g/sq m. (Stihler-Mass)
W78-08416

STUDIES ON THE POPULATION ECOLOGY OF THE SALT MARSH GASTROPOD BATILLARIA ZONALIS,
University of the Pacific, Dillon Beach, CA. Pacific Marine Station.
R. B. Whitlatch.
The Veliger, Vol. 17, No. 1, p 47-55, July, 1974. 6 fig, 4 tab, 14 ref.

Descriptors: *Population, *Ecology, *Gastropods, *Snails, *Salt marshes, Environment, Fluctuations, *California, *Batillaria zonalis, *Tomales Bay(California), Marsh pans.

Aspects of the life history of the salt marsh gastropod Batillaria zonalis were investigated for a period of two years. Population dynamics and aspects of its biology in two salt marsh localities in Tomales Bay, California, are described. The results of the study are discussed within the context of population stability in salt marsh communities. Variations in larvall recruitment and fluctuations in population density may be the result of local environmental conditions on the marsh. Juveniles in 1971 and 1972 settled only in the marsh pans of both salt marshes. No juveniles were recorded in any of the tidal creeks possibly due to the draining of the creeks at low tide and prolonged substrate exposure; the pans seldom drain completely. Small scale differences in other physical factors such as temperature, substrate characteristics, and salinity may also affect recruitment patterns, as well as variability in population abundance. Several possible mechanisms for reducing the effects of environmental fluctuations were noted: burial beneath the surface sediment; mobility by floating; cementation by glutinous threads to Salicornia pacifica stems 3 to 10 cm above the surface of the marsh; high resistance to dessication and salinity. (Maroncelli-Mass)
W78-08419

FACTORS INFLUENCING THE DISTRIBUTION OF VEGETATION OF THE COOPER RIVER ESTUARY,
Saint John's Univ., Jamaica, NY. Dept. of Biology.
R. Statler.
Castanea, Vol. 38, No. 1, p 18-24, March, 1973. 1 fig, 1 tab, 13 ref.

Descriptors: *Estuaries, *Salt marshes, *Freshwater marshes, *Salinity, Submergence, Vegetation, *Cooper River Estuary(SC), Vegetation zonation, *South Carolina.

The marshes of The Cooper River Estuary are categorized as three units: salt, brackish, and freshwater marshes. The vegetation of these marshes was sampled by means of the line intercept method during July, 1971. A surveyor's transit was used to determine the elevation range of each species above the species occupying the lowest portion of the marsh for 23 stations. Soil samples were taken and analyzed for chlorinity and salinity. Zonation of vegetation was most pronounced and distinct in salt marshes and less pronounced and distinct in less saline areas. Salinity limits the brackish and freshwater taxa from the more saline lower reaches of the river. Several taxa occupying the lowest zone of the three marshes are well adapted to long periods of submergence. (Maroncelli-Mass)
W78-08420

PROGRAM REVIEW PROCEEDINGS OF: ENVIRONMENTAL EFFECTS OF ENERGY RELATED ACTIVITIES ON MARINE/ESTUARINE ECOSYSTEMS.
Environmental Protection Agency, Washington, D.C. Office of Energy, Minerals, and Industry; and Environmental Protection Agency, Washington, D.C. Office of Research Development.
For primary bibliographic entry see Field 5C.
W78-08520

AN ECOLOGICAL CHARACTERIZATION OF THE CHENIER PLAIN OF SOUTHWESTERN LOUISIANA AND SOUTHEASTERN TEXAS: OBJECTIVES AND METHODOLOGIES,
Energy Resources Co., Inc., Cambridge, MA.
J. Harris.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 65-73, 1 fig.

Descriptors: *Environmental effects, *Water pollution effects, *Resources development, *Baseline studies, Coasts, Louisiana, Texas, Ecology, *Gulf Coast, *Outer Continental Shelf, *Chenier Plain, Ecological characterization.

The purpose of this program is to provide a more systematic procedure for both the examination of biological systems and the prediction of impacts on these systems. This new approach, termed 'ecological characterization,' is being applied first to the analysis of coastal systems. The distinguishing feature of the characterization, which makes it unique in comparison to conventional biological studies, inventories, and other environmental programs, is its emphasis on the functional and dynamic features of coastal systems. By studying these functional attributes of the system, we hope to come closer not only to understanding the driving forces of the represented ecosystems, but also to understanding how the system as a whole is affected by various resource development and environmental modifications. (See also W78-08520) (Sinha-OEIS)
W78-08526

THE CONSTRUCTION OF A CONCEPTUAL MODEL OF THE CHENIER PLAIN COASTAL ECOSYSTEM IN TEXAS AND LOUISIANA,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources; Florida Univ., Gainesville. Center for Wetlands; and Energy Resources Co., Cambridge, MA.
L. M. Bahr, Jr., J. W. Day, Jr., and T. Gayle.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 75-92, 13 fig, 9 ref.

Descriptors: *Water pollution effects, *Baseline studies, *Model studies, Coasts, Ecosystems, *Outer Continental Shelf, *Chenier Plain, *Gulf Coast.

In its present form, the conceptual model is a hierarchy of nested models that divide the Plain into three levels of spatial, functional, and temporal resolution of the habitat, the basin, and the region. By focusing attention at the appropriate level, this hierarchy allows the characterization and analysis of the Chenier Plain and the handling of the four issues of spatial heterogeneity, functional complexity, time scale problems, and management needs. Ten natural habitats have been identified and mapped for the Chenier Plain: nearshore Gulf; inland open water; salt, brackish, intermediate, and fresh marsh; wetland forest; uplant forest; beaches; and cheniers and ridges. Large areas have been modified by human activity, which have been catalogued into four additional habitats as impounded marshes, pastures, rice and crop habitat, and urban habitat. (See also W78-08520) (Sinha-OEIS)
W78-08527

ENVIRONMENTAL ASSESSMENT OF NORTHERN PUGET SOUND AND THE STRAIT OF JUAN DE FUCA,
National Oceanographic and Atmospheric Administration, Seattle, WA.
For primary bibliographic entry see Field 5C.
W78-08530

EDGE WAVES AND SURF BEAT,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Oceanography.
A. J. Bowen, and R. T. Guza.
Journal of Geophysical Research, Vol. 83, No. C4, p 1913-1920, April 20, 1978. 8 fig, 13 ref. ONR N00014-75-C-0030, NSF ENG76-1489.

Descriptors: *Waves(Water), *Beaches, *Ocean waves, Coasts, Shores, Surf, Model studies, Hydraulic models, Flumes, Laboratory tests, Mathematical models, Resonance, Frequency, Oceanography.

Surf beat, wave motion at relatively low frequency (periods of 30-200 s), often is observed on beaches. However, even with modern instrumentation it is difficult to describe the spatial variation of the low-frequency motion; consequently, the relative importance of a number of suggestions, which, at least in theory, provide mechanisms for the generation of low-frequency energy, has never been established. Recent observations have reinforced the idea that edge waves, the free wave modes trapped at the shoreline, are a major component of low-frequency energy. One of the most interesting explanations of surf beat suggests that the beating between particular pairs of incoming waves leads to resonant growth of edge wave modes, which may then dominate the low-frequency spectrum. Empirical evidence is essential, as any theoretical development breaks down when the incoming wave break. To investigate the importance of this resonant interaction, the general interaction conditions were used to design laboratory experiments in which both resonant and non-resonant conditions were expected. The experimental results showed that the response at the beat frequency is stronger when the resonance conditions for edge wave growth are satisfied and that the response is in the form of the theoretically predicted edge wave mode, even when the incident waves are breaking. These results strongly suggest that surf beat is predominantly an edge wave phenomenon. (Sims-ISWS)
W78-08551

DYNAMIC RESPONSES OF FLOATING STRUCTURES,
Exxon Production Research Co., Houston, TX.
For primary bibliographic entry see Field 8B.
W78-08560

DIFFRACTION OF WAVES BY A WEDGE,
Case Western Reserve Univ., Cleveland, OH. Dept. of Earth Sciences.
For primary bibliographic entry see Field 8B.
W78-08561

RUNUP OF IRREGULAR WAVES ON PLANE SMOOTH SLOPE,
Queen's Univ., Kingston (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-08562

WINTER CIRCULATION IN THE WESTERN GULF OF MAINE: PART I. COOLING AND WATER MASS FORMATION,
New Hampshire Univ., Durham.
W. S. Brown, and R. C. Beardsley.
Journal of Physical Oceanography, Vol. 8, No. 2, p 265-277, March 1978. 11 fig, 2 tab, 31 ref, 1 append. NSF DES75-03992, OCE76-02190.

Descriptors: *Water circulation, *Continental shelf, *Atlantic Ocean, *Gulfs, Winter, On-site investigations, Model studies, Mathematical models, Circulation, Oceans, Currents(Water), Ocean currents, Current meters, Cooling, Water cooling, Heat transfer, Salinity, Density, Water temperature, Estuaries, Oceanography, *Gulf of Maine.

The mean circulation on the northeast continental shelf in the region of the Gulf of Maine was discussed in terms of a simple box model, based on volume transports and mean salinities estimated from existing data. The results of this calculation indicated that warm salty water from the continental slope must mix with colder, fresher water at intermediate depths within the Gulf. Field measurements obtained as part of a study of the winter circulation in an offshore region in the western Gulf of Maine suggest that winter storms may be responsible for most of this vertical mixing. Ten 1-day hydrographic cruises were conducted between the passage of seasonal storms from November 1974 to January 1975. A description of the early winter evolution of the density field was obtained concurrently with moored measurements of current, temperature and bottom pressure, and coastal measurements of sea level and atmospheric variables. The principal vertical mixing process observed during this period was an intermittent overturning of the near-surface water caused by surface cooling by offshore winds. The observed vertical homogeneity suggests that the fresher near-surface Gulf of Maine water and the more saline deep basin water are frequently mixed during the early winter in the western region to produce Gulf of Maine Intermediate Water. (Sims-ISWS)
W78-08579

EFFECTS AND INTERACTIONS OF POLYCHLORINATED BIPHENYLS (PCB) WITH ESTUARINE MICROORGANISMS AND SHELLFISH,
Maryland Univ., College Park.
For primary bibliographic entry see Field 5C.
W78-08637

CONTROLLED-ENVIRONMENT BIVALVE MOLLUSCAN MARICULTURE,
Delaware Univ., Newark. Coll. of Marine Studies.
G. D. Pruder, E. T. Bolton, and P. H. Sammelwitz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 833, Price codes: A02 in paper copy, A01 in microfiche. Sea Grant Report No. DEL-SG-23-76, October 1976, 14 p, 5 fig, 8 ref.

Descriptors: *Aquiculture, *Methodology, *Oysters, Clams, *Commercial shellfish, Laboratory equipment, Mollusks, Growth, Reproduction, Delaware, Control system, *Mariculture, Controlled environment.

The Delaware Mariculture Project has as its objective the rapid development of commercial, closed-cycle, controlled-environment shellfish mariculture. The effort involves development of an efficient, reliable, and economical process and hardware system for raising selected bivalve molluscs from egg to marketable size. Suh a system must provide and maintain the physical, chemical, and biological conditions suitable for rapid growth of such commercially desirable bivalve molluscs as Crassostrea virginica (Gmelin), the Eastern oyster, and Mercenaria mercenaria (Linne), the hard clam. The status and direction of the project in 1976 is reviewed in this paper. (EIS-Katz)
W78-08644

REARING PACIFIC SALMON IN SALTWATER PONDS FERTILIZED WITH DOMESTIC WASTEWATER,
Humboldt State Univ., Arcata, CA.
For primary bibliographic entry see Field 5C.
W78-08645

REACTION OF ESTUARINE ECOSYSTEMS TO EFFLUENT FROM PULP AND PAPER INDUSTRY,
Aberdeen Univ. (Scotland). Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-08667

SEASONAL LARVAL FISH ABUNDANCE IN WATERS OFF DIABLO CANYON, CALIFORNIA,
Pacific Gas and Electric Co., San Ramon, CA. Dept. of Engineering Research.
For primary bibliographic entry see Field 5C.
W78-08678

THE IMPORTANCE OF PREDATION BY CRABS AND FISHES ON BENTHIC INFAUNA IN CHESAPEAKE BAY,
Virginia Inst. of Marine Sciences Gloucester Point.
R. W. Virnstein.
Ecology, Vol. 58, p 1199-1217, 1977. 15 fig, 8 tab, 81 ref.

Descriptors: *Predation, *Competition, *Secondary productivity, *Commercial shellfish, *Benthic fauna, Biological communities, *Dominant organisms, *Crabs, *Plankton, *Larval growth stage, *Growth rates, *Carrying capacity, *Food abundance, Invertebrates, Sediments, *Chesapeake Bay, *Blue crab, *Spot, *Hogchoker.

The significance of large motile predators in controlling the distribution and abundance of the macrobenthic invertebrates within the sediments (the infauna) in a shallow subtidal sand community was tested using manipulative field experiments. The blue crab (Callinectes sapidus) and 2 species of bottom-feeding fishes, spot (Leiostomus xanthurus) and hogchoker (Trinectes maculatus), were either excluded from or confined to small areas using wire mesh cages. Callinectes and Leiostomus effectively reduced infaunal densities; Trinectes did not. Densities of all infaunal species increased in exclosures, suggesting that their population densities under natural conditions are not controlled by competitive interactions. In this community, infaunal population sizes are limited by predation and not by food or space. Severe predation pressure and physical disturbances, particularly sediment instability, keep population levels far below the carrying capacity of the environment. Severe predation, and the rapid growth, short generation times, and rapid turnover rates of constituent populations suggest that such infaunal communities, despite a low standing crop, are an important food source for predator species important to man. (EIS-Deal)
W78-08692

FOOD CONCENTRATION AND STOCKING DENSITY EFFECTS ON SURVIVAL AND GROWTH OF LABORATORY-REARED LARVAE OF BAY ANCHOVY ANCHOA MITCHILLI AND LINED SOLE ACHIRUS LINEATUS,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
E. D. Houde.
Marine Biology, Vol. 43, No. 4, 1977, p 333-341, 4 fig, 5 tab, 16 ref.

Descriptors: Environmental effects, *Stocking, *Food abundance, Population, Number fish per acre, Mortality, Larvae, *Growth rates.

Eggs of bay anchovy were stocked at densities ranging from 0.5 to 32.0 per liter and eggs of lined sole were stocked at 0.5 to 16.0 per liter. Food concentrations had clearly defined effects on both survival and the indices of growth and yield for both species. To obtain relatively consistent and high survival rates exceeding 40% at metamorphosis, it was found that food concentration should be 1000/l or higher. Results indicated that it is doubtful that survival would routinely exceed 75% for bay anchovies or 80% for lined sole even if food were offered in excess of 5000 prey/l. Reasonable numbers of larvae of the two species could be produced at 100 prey/l, but the relative variability in observed survival and growth among replicated experiments probably would be too high to allow treatment effects in bioassays or other experiments to be identified. (Chilton-ORNL)
W78-08769

THE EFFECTS OF SAND MOVEMENT ON INTERTIDAL SEAWEEDS AND SELECTED INVERTEBRATES AT BOUND ROCK, NEW HAMPSHIRE, USA,
New Hampshire Univ., Durham. Dept. of Botany and Plant Pathology; and New Hampshire Univ., Durham. Jackson Estuarine Lab.
For primary bibliographic entry see Field 5C.
W78-08774

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

PREPARATION OF WATER SAMPLES FOR ASBESTOS FIBER COUNTING BY ELECTRON MICROSCOPY,
Ontario Research Foundation, Mississauga.
E. J. Chatfield, R. W. Glass, and M. J. Dillon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 183, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-600-4/78-011, January, 1978. 118 p, 44 fig, 42 tab, 27 ref, 1 append. 68-03-2389.

Descriptors: *Asbestos, *Analytical techniques, *Electron microscopy, *Ultrasonics, *Filtration, *Pollutant identification, Tailwater, Water pollution, Water quality, *Chrysotile, *Crocidolite, *Taconite, *Nuclepore filtration, *Millipore filtration, Concentrating techniques.

Procedures used by a number of laboratories for the analysis of asbestos fibers in water samples were investigated using standardized aqueous dispersions of chrysotile, crocidolite, and taconite tailings. Filtration problems when using polycarbonate filters (Nuclepore) were solved, and an optimum filtration technique was developed that permits microscopically uniform deposits to be obtained. Replicate analyses established fiber losses and reproducibility of five filter preparation techniques: (1) carbon-coated Nuclepore with Jaffe washer dissolution; (2) uncoated Nuclepore with Jaffe washer dissolution; (3) both 0.22 micrometer and 0.45 micrometer pore size Millipore, with Jaffe washer dissolution; (4) 0.45 micrometer pore size Milipore with condensation washer dissolution; (4) 0.45 micrometer pore size Millipore with condensation washer dissolution; and (5) Ontario Research Foundation (ORF) ashing technique. The carbon-coated Nuclepore technique had essentially zero fiber losses. The uniformity of the deposits on all the final electron microscope preparations was expressed quantitatively, and the most satisfactory performance was given by all of the Nuclepore techniques. Ultrasonic treatment at 20 kHz increased fiber concentrations of chrysotile suspensions but had no effect on crocidolite suspensions. (Seip - IPA)
W78-08263

3A. Saline Water Conversion

APPARATUS AND PROCESS FOR MEMBRANE FILTRATION,
Hoechst A.G., Frankfurt am Main (West Germany). (Assignee).
W. Saupe.
U.S. Patent No. 4,062,771, 11 p, 8 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 965, no 2, p 637, December 13, 1977.

Descriptors: *Patents, *Desalination, *Water treatment, *Separation techniques, Water quality control, Water purification, Semipermeable membranes, Desalination apparatus, Filtration.

Devices for membrane filtration are suitable for the separation of lower-molecular and ionic portions. They serve for the selective separation or concentration of individual components of solutions, suspension, emulsions or dispersions, for example, for concentrating salt water and brackish water. There is a need for apparatus suitable for carrying out membrane filtration which has a high module packing density, which is easy to assemble, and which allows the membranes and the members which support them to be changed in a simple manner, and which operates with as low as possible a local excess concentration and deposition of solids, so that the flux, that is the quantity which permeates per unit of time and per unit of membrane surfaces, remains approximately constant. This invention provides an apparatus which comprises at least two support members of porous material arranged in series, an inlet for admission of liquid to be filtered to the first support member and an outlet for egress of concentration from the last suport member, each support member being provided with passageways to allow flow of liquid through the assembly of support members in sequence through a semipermeable membrane. The flow of liquid from one support to he next is only via the passageways. All parts of their surface to which liquid has access, both the outer walls of the members themselves and the internal walls of the passages, are covered with semipermeable membrane in order to ensure that only liquid which has passed through the membrane can enter the internal pores of the support member. (Sinha - OEIS)
W78-08586

3B. Water Yield Improvement

MANUAL IRRIGATION IN MIDDLE AMERICA,
Colorado State Univ., Fort Collins.
G. C. Wilken.
Agricultural Water Management, Vol. 1, No. 2, p 155-166, September, 1977. 7 fig, 8 ref.

Descriptors: *Irrigation practices, History, Semiarid climates, Water shortage, Dry farming, Mexico, Manual control, *Water transfer, Water utilization, Water supply, Wells, Water costs, *Economic justification.

Manual irrigation continues to be widely used in Middle America, particularly in semi-arid regions of Mexico. Report describes and evaluates effectiveness of two general types of manual irrigation, container and scoop. Reasons for continued use of both types of irrigation include: (1) economic returns are feasible as low water costs compensates for high expenditure of time and effort; (2) careful manual application of irrigation water eliminates most plant deaths from overwatering; and (3) manually irrigated fields do not require furrows or heavy retaining borders. (Jewkes-Arizona)
W78-08545

IMPACT OF RAINFALL ENHANCEMENT ON HYDROLOGY,
Kansas State Univ., Manhattan. Dept. of Civil Engineering.
J. J. Zovne, and D. H. Rogers.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY5, Proceedings Paper 13759, p 681-694, May 1978. 9 fig, 3 tab, 20 ref, 2 append.

Descriptors: *Weather modification, *Cloud seeding, *Rainfall, *Kansas, Effects, Model studies, Mathematical models, Watersheds(Basins), Rainfall intensity, Runoff, Recharge, Groundwater, Base flow, Evapotranspiration, Precipitation(Atmospheric), Hydrology, Meteorology.

Three watersheds in Kansas were investigated to determine the hydrologic effects of a large-scale rainfall augmentation program. The Kansas Watershed Model was used to compare historical with augmented moisture budgets. The augmentation scheme involved 75% increase for rainfalls less than 0.1 in.; 30% increase between 0.1 in. and 0.5 in.; 10% increase between 0.5 in. and 1.0 in.; and 10% decrease for rainfalls more than 1 in. The three watersheds yielded average increased rainfalls of more than 2 in. annually, of which greater

than 20% became runoff and greater than 70% evapotranspired. The additional runoff was mostly a result of increased base flow, and a major proportion of the increased evapotranspiration occurred during dry periods. Optimal benefits would accrue as a result of long-term seeding programs because of accumulated moisture carryover effects. (Sims-ISWS)
W78-08570

RESIDUAL WAXES FOR WATER HARVESTING,
Agricultural Research Service, Phoenix, AZ. Water Conservation Lab.
D. H. Fink.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 7. Proceedings, Meetings of the American Water Resources Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, April 15-16, 1977, Las Vegas, Nevada, p. 199-205, 1 fig, 5 tab, 12 ref.

Descriptors: *Water harvesting, *Water yield improvement, *Coatings, *Soil management, Soil treatment, Runoff, Runoff coefficient, *Water conservation, Rainfall-runoff relationships, *Waxes.

This study was undertaken to compare the water harvesting potential of several residual waxes with that of refined paraffin. These residual waxes could possibly have advantages over refined paraffin as a soil treatment for water-harvesting catchments in that they are byproducts rather than an end product (constituting an energy savings), are slightly cheaper, and are more adhesive and less brittle. However, these residual waxes have high physical - chemical property variability which complicates testing for utility in water-harvesting. The lack of an easily obtainable 'characterization index' is a particular deficiency. Upon laboratory testing, several of the residual waxes were found to be superior to refined paraffin in water-repellancy, structural stability, erosion and freeze-thaw resistance and ozone and ultraviolet radiation effects. The need for further laboratory and field testing was noted. (Payton-Arizona)
W78-08731

VARIATION IN SOIL MOISTURE UNDER NATURAL VEGETATION,
New Mexico State Univ., University Park. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2D.
W78-08733

ROOT SYSTEM OF SHRUB LIVE OAK IN RELATION TO WATER YIELD BY CHAPARRAL,
Rocky Mountain Forest and Range Experiment Station, Tempe, AZ. Forestry Sciences Lab.
E. A. Davis.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 7. Proceedings, Meetings of the American Water Resources Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, April 15-16, 1977, Las Vegas, Nevada, p. 241-248. 3 fig, 17 ref.

Descriptors: *Root systems, *Root development, Soil-water-plant relationships, Soil moisture, Root zone, *Water utilization, Distribution patterns, Subsoil, Moisture availability, Growth stages, *Water yield improvement, Vegetation effects, *Regolith.

The root system of shrub live oak (Quercus Turbinella) was studied in an initial effort to classify the major Arizona chaparral shrubs as potential users of soli water based on root system characteristics. This system was of the generalized type with a taproot, many deeply penetrating roots, and a strong lateral root system. Roots penetrated 21 feet to bedrock through cracks and fractures in the rocky regolith. A dense network of small surface laterals radiated from the root crown and permeated the upper foot of soil. Because of its root system, shrub live oak is well adapted to utilize ephemeral surface soil moisture as well as deeply stured moisture. Emphasis is on the importance of a knowlede of the root systems and depth of the regolith in planning vegetation conversions to increase water yield. (Payton-Arizona)
W78-08734

EFFECTS OF BRUSH TO GRASS CONVERSION ON THE HYDROLOGY AND EROSION OF A SEMIARID SOUTHWESTERN RANGELAND WATERSHED,
Agricultural Research Service, Tucson. AZ. Southwest Watershed Research Center.
For primary bibliographic entry see Field 4D.
W78-08735

RECOMMENDED DROUGHT AND SALT-RESISTANT ORNAMENTAL PLANTS,
Ben-Gurion Univ. of the Negev, (Beersheba (Israel). Div. of Plant Introduction and Applied Ecology.
M. Forti, J. Ben-Dov, and J. Pasternak.
Ben-Gurion University of the Negev, Research and Development Authority, 1977. 6 p. B GUNRDA-132-77.

Descriptors: Ecology, *Desert plants, Plant groupings, *Brackish water, Irrigation practices, *Salt tolerance, *Plant growth, *Saline soils, Environmental effects, Plant physiology, *Drought tolerance.

The recommened drought-resistant ornamental plants included trees, tall shrubs, shrubs, and dwarf shrubs, which have been grown and observed at the Institute for Applied Research for a twelve year period. The preferred salt-resistant ornamental plants had been grown at various locations throughout Israel in saline soils using brackish water irrigation for four years. Salt resistant plants were classified according to their ability to withstand poor drainage and bad aeration. Detailed lists of all drought-resistant plants and salt-resistant plants are included in the report. (Jewkes-Arizona)
W78-08752

3C. Use Of Water Of Impaired Quality

VEGETATIVE STABILIZATION OF SPENT OIL SHALES: VEGETATION, MOISTURE, SALINITY, AND RUNOFF - 1973-1976,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 5G.
W78-08268

HYDRODYNAMIC DISPERSION DURING ABSORPTION OF WATER BY SOIL,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.
For primary bibliographic entry see Field 2G.
W78-08557

CALIBRATION STABILITY AND RESPONSE TIME FOR SALINITY SENSORS,
Agricultural Research Service, Riverside, CA. Salinity Lab.
For primary bibliographic entry see Field 2G.
W78-08559

THEORETICAL MODELING OF MIXED-ELECTROLYTE SOLUTION FLOWS FOR UNSATURATED SOILS,
Agricultural Research Organization, Bet Dagan (Israel). Div. of Soil Physics.
For primary bibliographic entry see Field 2G.
W78-08563

DWARF WHEAT, GIANT CHANGES,
Agency for International Development, Washington, DC.
For primary bibliographic entry see Field 3F.
W78-08742

OBSERVATIONS OF SOIL WATER AND SALT MOVEMENT UNDER DRIP AND FLOOD IRRIGATION IN AN APPLE ORCHARD,
Commonwealth Scientific and Industrial Research Organization Merbein (Australia). Div. of Horticultural Research.
J. Groot Obbink, and D. McE. Alexander.
Agricultural Water Management, Vol 1, No 2, p 179-190, September 1977. 4 fig, 3 tab, 10 ref.

Descriptors: Soil water movement, Semiarid climates, Water utilization, *Irrigation systems, Salts, Sampling, Soil-water-plant relationships, Soil moisture, Flood irrigation, Surface irrigation, *Apples, *Orchards, On-site investigations, Water distribution(Applied), Water utilization, Australia, Water shortage.

Successful orchard management in an arid climate depends upon adequate application and distribution of water. Research experiments compared effects of drip and flood irrigation on soil moisture and salt movement in a mature apple orchard, with a semiarid climate in Australia. Part of an orchard, previously flood irrigated, was converted to drip irrigation in Ausust 1971 and maintained until May 1975. The remainder of the orchard was irrigated as before. Results suggested: (1) high salt concentrations were observed in soil layers in the drip irrigation experiment while lower, less variable salt concentrations were observed in the flood irrigation experiment; (2) sampling of the apple yields together with moisture and chloride content of leaves showed significant annual changes but no significant differences between treatments; (3) tree girths were smaller with drip irrigation; and (4) drip irrigation operated successfully for the trial period. (Jewkes-Arizona)
W78-08745

NATURE AND IMPACT OF TEMPERATURE AND MOISTURE IN ARID WEATHERING AND SOIL FORMING PROCESSES - A REVIEW.
Ghent Rijksuniversiteit (Belgium). Lab. for Physical Geography and Pedology.
For primary bibliographic entry see Field 2G.
W78-08755

3D. Conservation In Domestic and Municipal Use

HANDBOOK OF WATER RESOURCES AND POLLUTION CONTROL.
For primary bibliographic entry see Field 5D.
W78-08543

CU/U ORE-LEACHING ROUTE CUTS POLLUTION, TRIMS COSTS,
G. Parkinson.
Chemical Engineering, Vol. 85, No. 10, p 54-55, April, 1978. 1 fig.

Descriptors: *Uranium, *Copper, *Acid mine water, *Mine drainage, *Leaching, *Acid streams, Sulfur compounds, Construction materials, Cathodes, Solvent extractions, Design criteria, Solubility, Waste water treatment, Industrial wastes.

A thin layer copper and uranium ore leaching process has been developed by Holmes and Narver, Inc. of Orange, California, as an economical alternative to agitation leaching. The copper or uranium ore is spread in a layer 3 ft deep or less

and treated with sulfuric acid followed by shallow bed leaching. The process will be used at a Chilean copper processing plant which will handle 2,600 metric tons ore/day and produce 45 metric tons cathode copper/day. The plant will initially process ore with 80% acid soluble copper; the ore is crushed and passed to a rotating drum for treatment with concentrated sulfuric acid. The sulfuric acid-bearing ore is stored in a cure pile for 24 hrs before it is deposited on acid-resistant concrete leaching beds; the beds are sprayed with leach liquor, followed by raffinate containing 7.5-9.0 g/liter to 5-6 g/liter, considered the optimum level for the solvent-extraction process. The thin layer process produces tailings with a moisture content of about 15%, compared to the 50% content required for disposal of tailings from conventional copper and uranium extraction methods. This eleminates the need for extensive evaporation ponds as the drier tailings can be piled to a height of 35-40 ft or used to backfill mined-out areas. (Lisk-FIRL)
W78-08624

EROSION AND SEDIMENT CONTROL IN URBANIZING AREAS,
Soil Conservation Service, College Park, MD.
For primary bibliographic entry see Field 4D.
W78-08798

3E. Conservation In Industry

WATER CONSERVATION AND POLLUTION CONTROL IN COAL CONVERSION PROCESSES,
Water Purification Associates, Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-08228

SLIME CONTROL METHOD,
Kurita Water Industries Ltd., Osaka (Japan). (Assignee).
For primary bibliographic entry see Field 5G.
W78-08595

PROCESS FOR TREATING WASTE WATER CONTAINING POLYVINYL ALCOHOL,
Sando Iron Works Co., Ltd. (Japan). (Assignee).
For primary bibliographic entry see Field 5D.
W78-08604

HIGH-EFFICIENCY BROWNSTOCK WASHER SYSTEMS--CONSIDERATIONS IN MEASURING LOSSES,
Chesapeake Corp. of Virginia, West Point.
For primary bibliographic entry see Field 5D.
W78-08621

3F. Conservation In Agriculture

WEATHER AND WATER.
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 2B.
W78-08245

DETERMINING THE USEFULNESS OF REMOTE SENSING FOR ESTIMATING AGRICULTURAL WATER DEMAND IN CALIFORNIA,
California Univ.-Berkeley. Remote Sensing Research Program.
R. N. Colwell.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-30551, Price codes: A04 in paper copy, A01 in microfiche. Semi-Annual Report, Space Sciences Laboratory Series 18, Issue 59, 1977. 65 p, 22 fig, 15 tab. NASA NSG 2207.

Descriptors: *Remote sensing, *Satellites(Artificial), *California, *Irrigation, *Agriculture, *Water demand, *Water supply, *Crop production, *Data collections, Analytical techniques, Statistics, Mapping, *Crop classification, *LANDSAT, Crop types, Spatial signature extension, Cropland.

Implementation of an operational methodology by which the California Department of Water Resources (DWR) can extract information from a LANDSAT-based remote sensing system to obtain irrigated acreage statistics is described. Techniques for specific crop type determination were tested in Kern County. Project accomplishments include: (1) review of DWR's land use survey requirements, specifically as to the need for crop-specific data, map formats, and statistica studies; (2) demonstration of the need to broadly regionalize the variety of environments in California for determination of an optimum mix of remote sensing techniques for each environment; (3) demonstration of the significant impact of spatial signature extension on the cost-effectiveness and transferability of remote sensing techniques; (4) a 1976 update map of Kern County cropland; and (5) LANDSAT crop keys for all major County crops. Multicropping was difficult to classify using the available imagery and manual techniques. Average manual classification accuracy and water demand group accuracy were 71% and 84%, respectively. Two digital data sets are being processed: conventinal LANDSAT image keys, were made to select optimum periods to discriminate fallow, small grans, and cotton from all other corps. Techniques developed in the study have been extended to a Sacramento test site for the 1976 crop season using DWR ground truth data. Multiyear extension in 1975 and 1976 are described; a comprehensive evaluation was performed during the 1977 crop season using data previously collected. (Seip-IPA)
W78-08256

WATER MOVEMENT IN BARE AND CROPPED SOIL UNDER ISOLATED TRICKLE EMITTERS: I. ANALYSIS OF BARE SOIL EXPERIMENTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-08313

IRRIGATION MANAGEMENT: AN INFORMATION SYSTEM APPROACH,
Lincoln Coll. (New Zealand).
I. J. Ritchie, J. B. Dent, and M. J. Blackie.
Agricultural Systems, Vol 3, No 1, p 67-74, January, 1978. 21 ref.

Descriptors: *Irrigation systems, *Planning, Distribution systems, Water shortage, Water supply, Arid climates, Water management(Applied), Crop production, *Wheat, Soil moisture, Water costs, Simulation analysis, Climatic data, Information retrieval, Flood irrigation, Sprinkler irrigation, Water allocation(Policy), *Water conservation.

A model irrigation information system was developed so that farmers and extension workers could determine its practical applications for farms in arid climates supporting both irrigated mixed crops and livestock. Two basic types of irrigation, sprinkler and flood, were investigated. Farmers were assisted in determining the total acreage to be irrigated. Water allocation planning included estimating water needed form both crops and livestock, regulating the limited irrigation water supply in relation to crop demands and climatic changes, and allocating daily water supply between crops and livestock. Potential with limited water supply; (2) Evaluation of irrigation programs by careful daily monitoring of irrigation practices for crops and animals. (Jewkes-Arizona)
W78-08369

LIVING WITH A RIVER: TRADITIONAL FARMERS OF THE RIO SAN MIGUEL,
Arizona-Sonora Desert Muzeum, Inc., Tucson.
T. E. Sheridan, and G. P. Nabhan.
The Journal of Arizona History, Vol 19, No 1, p 1-16, Spring, 1978. 18 ref. NSF-SOC-75-13-628 and NSF-BNS-77-0852.

Descriptors: *Water conservation, Land management, Mexico, Arid lands, Watershed management, History, *Water resources development, *Irrigation practices, Canals, Wells, Livestock, Human population, Water control, Water shortage, Subsistence, Crop production.

Historical research indicates the semiarid San Miguel Valley, located in Sonora, Mexico has been successfully farmed since prehistoric times. Careful watershed management, skillful irrigation practices and the wise choice of crops adapted to an arid climate have contributed to the continued successful farming of the region. Present day farmers practice subsistence farming and livestock raising, using many of the traditional methods of water conservation and land management of their ancestors, continuing use of shallow wells using river resources instead of deep groundwater pumping. (Jewkes-Arizona)
W78-08389

PLANT POPULATION AND ROW SPACING FOR IRRIGATED AND RAINFED OILSEED SUNFLOWERS (HELIANTHUS ANNUUS) ON THE DARLING DOWNS,
Queensland Wheat Research Inst., Toowoomba (Australia). Primary Industries Dept.
B. J. Radford.
Australian Journal of Experimental Agriculture and Animal Husbandry, Vol 18, No 90, p 135-142, February, 1978. 6 fig, 4 tab, 10 ref.

Descriptors: *Australia, Arid climates, Planting management, Moisture availability, *Irrigation effects, *Plant growth, Crop production, *Plant physiology, *Climatic data, *On-site data collections, *Plant populations, *Irrigation practices, *Soil-water-plant relationships, *Water requirements, Sunflowers, Row spacing.

Experiments were conducted to determine the optimum plant population and row spacing for oilseed sunflower crops grown under both irrigated and rainfed conditions on the Darling Downs, Australia. Three irrigated and four rainfed test trials were held from 1968-1969 to 1972-1973. Test results summarized: (1) experimental and cropping data for irrigated and rainfed trials, (2) moisture data, (3) time and degree days to 50 percent flowering and maturity, (4) effects of plant population and row spacing. Results suggested highest oil yields were obtained with plant populations of 50,000 to 100,000 plants ha-1 in irrigated trials and 40,000 to 60,000 plant ha-1 in rainfed trials. Rows 36cm. wide outyielded in five out of seven test trials. (Jewkes-Arizona)
W78-08395

WATER REQUIREMENTS OF AVOCADO IN ISRAEL, II. INFLUENCE ON YIELD, FRUIT GROWTH AND OIL CONTENT,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
E. Lahav, and D. Kalmar.
Australian Journal of Agricultural Research, Vol. 28, No. 5, p 869-877, September, 1977. 5 fig, 5 tab, 8 ref.

Descriptors: *Water conservation, Sprinkler irrigation, Crop response, Rates of application, *Plant growth, *Water management(Applied), *Water utilization, *Irrigation practices, *Irrigation effects, *Soil-water-plant relationships, *Plant physiology, Timing, *Consumptive use, *Water requirements, *Irrigation efficiency, *On-site tests, *Stone fruits, Avocados, Israel.

Detailed summary of a 6 year irrigation experiment on the avocado three was reported in a previous article. In this article, measurements of fruit growth and oil content of the avocado were discussed for avocado plantations with heavy soils using sprinkler irrigation systems. Tests suggested that continued irrigation over a period of years increased the avocado trees' rate of growth and fruit yield. The Hass cultivar appeared to make the maximum use of water. Recommended irrigation schedule was frequent irrigation in the summer and autumn, with no irrigation in the spring. Tests demonstrated that frequent irrigation only slightly increased the oil percentage in the fruit. Most favorable irrigation schedule recommended was a 21 day irrigation cycle, using approximately 6680 m3/ha water annually, with an additional estimated 6000 m3 water derived from winter rains. (Jewkes-Arizona)
W78-08422

PHYSICAL AND CHEMICAL CHANGES IN FRUIT OF SEVEN AVOCADO CULTIVARS AT MILDURA,
Victoria Dept. of Agriculture, Mildura (Australia). Horticultural Research Station.
B. M. El-Zeftawi.
Australian Journal of Agricultural Research, Vol 29, No 1, p 81-89, January, 1978. 5 fig, 14 ref.

Descriptors: *Australia, Irrigation practices, On-site data collections, *Analytical techniques, Evaluation, *Plant growth, *Plant growth substances, Fruit crops, *Stone fruits, Crop production, Arid lands, Avocados.

Experiments dealt with the expanding avocado industry in the irrigated area near Mildura, Victoria, 1974-1975. The tests were designed to determine and to evaluate changes before and after harvesting of 7 different avocado cultivars as indicators of the fruit's maturity. Similarities and differences between the cultivars were summarized, emphasizing the limitations of the experiments. Suggested conclusions indicated that moisture content and/or seed weight could be used by growers to estimate the oil content of the fruit and to select the optimum time for picking. On the basis of a minimum oil content of 8% as crude fat extract, tests suggested fruit could be picked from May to September. Under local conditions Zutano could best be picked in May, Fuerte in July, Hazzard in September, and other cultivars between July and September. (Jewkes-Arizona)
W78-08427

AGRICULTURAL WATER DEMANDS: PRELIMINARY RESULTS OF SILISTRA CASE STUDY,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6D.
W78-08428

IRRIGATION EMITTER,
L. Spencer.
U.S. Patent No. 4,058,257, 9 p, 27 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 964, No. 3, p 834, November 15, 1977.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Mist irrigation, Irrigation efficiency, Application equipment, Flow control, Drip irrigation.

An irrigation emitter includes a fixed longitudinally extending passage wall element having a longitudinally extending restricted flow groove. A flexible longitudinally extending passage wall element overlies the fixed wall element contacting it along its side margins to define a flush passage. It is adapted to collapse against the fixed wall element to confine flow to the restricted flow groove. The irrigation emitter which with minimum change in parts, may be arranged for drip flow, trickle flow, mist spray or sprinkler spray during an irrigation flow cycle and, in each case, undergoes flush flow at the start and finish of a flow cycle. The mist or sprinkler spray discharge may also be arranged to produce spray patterns arranging from a segmental spray to a full circle spray. (Sinha-OEIS)
W78-08582

SPRINKLER HEAD SEALING APPARATUS,
Senninger Irrigation, Inc., Orlando, FL. (Assignee).
M. Healy.
U.S. Patent No. 4,062,494, 4 p, 3 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 965, no 2, p 549, December 13, 1977.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, Application equipment, Irrigation efficiency, Irrigation practices.

A rotatable head sprinkler apparatus incorporates a lower bearing seal between a swivel device for connection to a source of water under pressure, and a spindle connected through the swivel device to a self-powered rotary sprinkler head of the type used for irrigation. A bearing washer is formed into the swivel device and forms a coupling for a protective seal which prevents the entry of trash, or the like, into the area between the seal and the wear washer. (Sinha - OEIS).
W78-08584

TRACT-TAILORED CONTROL MEANS AND METHOD FOR CENTER-PIVOT IRRIGATION APPARATUS,
T. V. Olson, and C. G. Olson.
U.S. Patent No. 4,063,569, 8 p, 7 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 965, no 3, p 899, December 20, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, Irrigation practices, Control systems, Timing, Rates of application.

The general object of this invention is to provide a tract-tailored control means for electric-drive and hydraulic-drive center-pivot irrigation apparatuses so that water applied per unit land-area from a solitary center-pivot apparatus can be controlled from sector to sector according to the peculiarities of the land tract to be irrigated. The tract-tailored control means generally comprises a primary-timer, and a secondary-timer, and perhaps too a tertiary-timer, etc., on the display panel and arranged in parallel branches along the electrical power-path, and togeter with patterned template or other tract-tailored automatic switching means program for causing the electric current to flow alternatively and exclusively through the appropriate timer and according to the pre-programmed exigiencies of the particular land tract to be irrigated with a solitary center-pivot apparatus. (Sinha - OEIS)
W78-08588

SUBTERRANEAN IRRIGATION SYSTEM,
E. R. Brandt.
U.S. Patent No. 4,065,926, 6 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 966, No 1, p 47 January 3, 1978.

Descriptors: *Patents, *Irrigation, *Subsurface irrigation, Irrigation systems, Irrigation efficiency, Irrigation practices, Grid pattern.

An irrigation system employs a grid pattern of interconnected flow passages which is interred beneath the surface of the area to which water, or any liquid, is to be applied. The grid pattern of flow passages is fed through an inlet using a gravity feed from the source of water. The grid is formed from two sheets of plastic which are heat sealed about their edges as well as within their center portion so as to form a series of perpendicularly oriented and intersecting lines of flow passages. It is through these passages that the water flows. Located at spaced intervals, and having specifically designed sizes directly proportional to their distance from the grid 'inlet' are apertures formed in the flow passages to permit water to escape to the soil being watered. (Sinha-OEIS)
W78-08601

A NEW DIELECTRIC SOIL MOISTURE METER FOR FIELD MEASUREMENT OF SOIL MOISTURE,
Technical Univ. of Prague (Czechoslovakia). Dept. of Irrigation and Drainage.
For primary bibliographic entry see Field 2G.
W78-08707

DEEP PLOWING, CURE FOR SODIC CLAYPAN,
Agricultural Research Service, Mandan, ND.
F. M. Sandoval, and F. C. Jacober.
Crops and Soils Magazine, Vol 29, No 7, p 9-10, April-May, 1977. 1 fig.

Descriptors: Soil investigations, Soil tests, Soil types, Soil treatment, Soil structure, Soil profiles, *Cultivation(Deep plowing), *Great Plains, *Alkaline soils, *Clay pan soils.

Sodic claypan soils are not desirable. More common names for this type of soil are scabland, scabspot land, or panspot land. How common are these soils. We have about 17 million acres in the Northern Great Plains. There are another 12 million acres to the north in the Canadian prairie provinces. (Skogerboe-Colorado State)
W78-08708

OUR NEWEST NATURAL RESOURCE--COMPACTION--GOOD AND BAD EFFECTS ON ENERGY NEEDS,
Agricultural Research Service, Morris, MN.
W. B. Voorhees, and J. G. Hendrick.
Crops and Soils Magazine, Vol 29, No 7, p 11-13, April-May, 1977. 1 fig.

Descriptors: Soil properties, *Soil compaction, Soil density, *Soil erosion, Runoff, Soil management, Soil structure, Soil physical properties, Bulk density, Crop production, Root growth.

Soil compaction caused by wheel traffic during normal farming operations can create serious erosion and water runoff problems, and can drastically restrict root growth and reduce crop yields. (Skogerboe-Colorado State)
W78-08709

ROUNDTABLE: IRRIGATION-FERTIGATION, WHEN SHOULD NITROGEN BE APPLIED TO CROPS AND IN WHAT FORM,
Minnesota Univ., St. Paul. Dept. of Soil Science.
A. C. Caldwell, L. S. Murphy, B. B. Tucker, R. A. Wiese, and J. C. Zubriski.
Crops and Soils Magazine, Vol 29, No 7, p 14-21, April-May, 1977. 5 fig.

Descriptors: *Nitrogen, Nutrients, *Fertilizers, Fertilization, Rainfall, Soil water, Soil moisture, Economics, *Application rates.

Various experiments of irrigation-fertilization are presented by five authoritative authors. The fertilization time frame and injection of fertilizers in irrigation water and the economics of fertilization are considered. (Skogerboe-Colorado State).
W78-08710

SHOULD YOU BE USING NITRAPYRIN,
Wisconsin Univ.-Madison. Dept. of Soil Science.
L. M. Walsh.

Crops and Soils Magazine, Vol 30, No 1, p 8-10, October, 1977. 1 fig, 2 tab.

Descriptors: *Nitrogen, *Fertilizers, Fertilization, Nutrients, Crop production, *Nitrapyrin, *N-Serve, Nitrogen compounds.

A new product called N-Serve (nitrapyrin) has been getting a lot of attention since its commercial introduction last fall. This product is designed to cut losses of nitrogen fertilizer. (Skogerboe-Colorado State)
W78-08711

SOLAR ENERGY TO POWER IRRIGATION PUMPS.
Agricultural Engineering, Vol 58, No 7, p 41-42, July, 1977. 2 fig.

Descriptors: Irrigation, *Irrigation practices, *Pumps, Pumping plants, Pumping, Solar radiation, *New Mexico, Electrical equipment, Electricity, Electrical power production, Electric power, *Solar energy power.

The sun powers the sump pump in the experimental irrigation system now operating at Gila Bend, Arizona. The system, developed by Battelle Memorial Institute with financial backing by Northwestern Mutual Life Insurance Company, delivers 10,000 gpm to 25,000 acres planted in cotton, wheat, barley, alfalfa and safflower. (Skogerboe-Colorado State)
W78-08712

CAN SUNSHINE POWER THE IRRIGATION PUMP,
New Mexico State Univ., University Park. Dept. of Agricultural Engineering.
G. H. Abernathy, and T. R. Mancini.
Agricultural Engineering, Vol 58, No 10, p 39-40, October, 1977. 1 fig.

Descriptors: Irrigation, *Irrigation practices, *Pumps, Pumping, Solar radiation, *New Mexico, Electrical equipment, Electricity, Electrical power production, Electric power, *Solar energy power.

The Torrance County Land and Livestock Co. in New Mexico's Estancia Valley is the site of the new experimental solar-powered pumping plant funded by the State of New Mexico and ERDA. Sandia Laboratories engineered the pumping system. New Mexico State University will conduct the agricultural experiments. Three crops will be grown yearly. (Skogerboe-Colorado State).
W78-08713

A LOOK AT THE DRIP/TRICKLE INDUSTRY,
G. O. Fraser, Jr.
Water and Irrigation, p 5-11, 27-28, November, 1977. 5 fig, 2 tab.

Descriptors: Irrigation, Irrigation efficiency, *Irrigation practices, Water conservation, *Drip-trickle irrigation.

Leaders of the drip/trickle irrigation industry present their ideas regarding the state-of-the-art of this type of irrigation. (Skogerboe-Colorado State)
W78-08714

BUYING AUTOMATIC IRRIGATION,
S. Kennedy.
Weeds, Trees, and Turf, Vol. 16, No. 1, p 15, 18, January, 1977. 1 fig.

Descriptors: Irrigation, *Irrigation practices, *Irrigation systems, Irrigation efficiency, Automation, *Automatic control(Irrigation), Turf, *Ohio, Golf courses, Recreation facilities.

After 44 years with the same irrigation system, the Columbus Country Club decided to replace it. Superintendent Steven Kennedy tells how he went about doing so and offers some advice to superintendents who plan to replace their systems. (Skogerboe-Colorado State)
W78-08715

FREQUENT IRRIGATION MORE EFFICIENT,
Agricultural Research Service, Peoria, IL.
W. W. Martin.
Crops and Soils Magazine, Vol. 29, No. 5, p 10-12, February, 1977. 3 fig.

Descriptors: Irrigation, *Irrigation practices, Irrigation effects, *Soil water, Soil moisture, Fertilizers, Irrigation efficiency, *Sands, Water pollution control, Water conservation.

Frequent, light irrigations on sandy soil save water and the energy to pump it and also reduce the amount of fertilizer nitrogen moving below the reach of plant roots as a potential ground water pollutant. (Skogerboe-Colorado State)
W78-08716

DIMENSIONLESS SOLUTIONS OF BORDER-IRRIGATION ADVANCE,
California Univ., Davis. Dept. of Land, Air and Water Resources.
N. D. Katopodes, and T. Strelkoff.
ASCE Journal of the Irrigation and Drainage Division, Vol. 103, No. IR4, p 401-417, December, 1977. 14 fig, 11 ref, 2 append.

Descriptors: Hydraulics, Hydrodynamics, *Irrigation engineering, Mathematical models, *Surface irrigation, *Model studies, *Froude number, *Infiltration, *Kostiakov infiltration equation, *Flow deviation, *Border irrigation.

The equations of border-irrigation flow are written in dimensionless form and solved numerically at three different levels of mathematical approximation. For the advance phase three independent parameters exist: the Froude number based on normal depth, the dimensionless exponent of the Kostiakov infiltration equation, and a dimensionless parameter determining the deviation of flow conditions from normal. It is shown both by order of magnitude analysis and from the results of the numerical computation that the inertia terms in the governing equations are unimportant for border flow (Froude number approximately zero). The model governed by the remaining two parameters, the zero-inertia model, is used to generate dimensionless advance trajectories and related information for all practical combinations of these two parameters. An additional advance trajectory is computed focability of the latter. (Skogeboe-Colorado State)
W78-08717

WINTER'S DOCTRINE: A REVIEW,
Nevada Univ., Reno. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6E.
W78-08718

DESIGN OF DRIP IRRIGATION LINES WITH VARYING PIPE SIZES,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 8B.
W78-08719

MODELING INFILTRATION UNDER MOVING SPRINKLER IRRIGATION SYSTEMS,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-08720

EXPERIMENTAL EVALUATION OF TWO INFILTRATION EQUATIONS,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-08721

THE CONTROL OF NITRATE AS A WATER POLLUTANT,
Texas Agricultural Experiment Station, College Station.
For primary bibliographic entry see Field 5G.
W78-08723

ALTERNATIVE ENERGY SOURCES IN THE USSR,
Royal Swedish Academy of Science (Stockholm).
R. Grunbaum.
AMBIO, Vol. 7, No. 2, p 49-55, March - April, 1978. 6 fig, 22 ref.

Descriptors: *Winds, Alternative planning, Solar energy, Geothermal studies, Water resources development, *Arid lands, Water supply, Irrigation programs, *Energy conversion, Wind energy, *Desalinization processes, Free energy, Energy transfer, *USSR.

Alternative energy resource programs have been undertaken in the USSR, particularly in regions where conventional sources are too expensive or inconvient. Various uses of wind energy have included the generation of power for the pumping and desalinization of groundwater, and for farm irrigation equipment. Experiments suggested windpower could generate sufficient power to provide livestock in Central Asia with an adequate water supply under favorable conditions. Wind machines have been specially constructed to supply electrical energy for farm irrigation equipment in the Kazakh Republic. In the Kara-Kum desert, solar energy plants have provided power for the desaliniation of groundwater to supply water for livestock. Various potential uses of windpower, solar energy, tidal and geothermal energy discussed. (Jewkes-Arizona)
W78-08736

PRELIMINARY EXPERIMENTS ON THE GROWTH OF KENAF (HIBISCUS CANNABINUS) FOR PAPER PULP PRODUCTION IN THE ORD IRRIGATION AREA, WESTERN AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, St. Lucia (Australia). Div. of Tropical Agronomy.
I. M. Wood.
Austrlian Journal of Experimental Agriculture and Animal Husbandry, Vol. 18, No. 90, p 97-106, February, 1978. 3 fig, 9 tab, 13 ref.

Descriptors: *Australia, Arid climates, Analytical techniques, *Plant growth, *Crop production, Soil-water-plant relationships, Management, Water management(Applied), *Kenaf, Hibiscus cannabinus.

Two experiments during 1973 and 1974 at the Kimberley Research Station in arid Western Australia studied kenaf (Hibiscus cannabinus) grown for paper pulp production. Experiment 1 with cv. 2032 examined crop growth at 4 seeding rates, 2 row spacings and 4 times of sowing. In experiment 2, growth of cv. Guatemala-4 was followed at 2 sowing times. Study results indicated: (1) year-row growth of kenaf could be sustained by irrigation; (2) the best crop yield was 25.6 tons ha-1, achieved after 240 days from a July sowing of Guatemala-4; (3) dry matter yields from cv. C2032 were highest with narrow row spacing on 1.5 m beds with 5 rows spaced 20 cm. apart. Row spacing mainly effected yields of tops and foliage. A seeding rate of 15-20 kg ha-1 appeared to be optimum; and (4) ratooning of kenaf is feasible, provided plants are cut between 10 cm. and 30 cm. above ground level.

Plant recovery after cutting is highest at 30 cm. (Jewkes-Arizona)
W78-08738

MODERNIZING THE MASAI,
Agency for International Development, Washington, DC.
E. George.
Agenda, Vol 1, No 3, p 12-16, March 1978.

Descriptors: *Nomads, *Water resources development, Arid lands, Water supply, Land use, *Livestock, *Range management, Grazing, Cattle, Carrying capacity, Water requirements, *Water management(Applied), Multiple-purpose projects, *Institutions, *Tanzania, *Kenya, Africa.

Nomadic Masai herdsmen prefer their traditional methods of livestock grazing and searching for water sources. The Tanzania and Kenya governments have cooperated on a livestock development project with AID assistance. AID projects have encouraged a Masai village settlement program in areas capable of supporting agricultural development, and have provided technical training in modern methods of animal husbandry, range management, marketing, and disease control. AID programs have assisted with the development and operation of the Tanzania Livestock Marketing Company, the formation of 22 ranching associations, the opening of 6 veterinary centers, the building of access roads and the development of a land survey to determine grazing patterns and available water resources. Construction of small dams and wells are expected to provide more reliable water sources for livestock. (Jewkes-Arizona)
W78-08740

WATER AND NUTRIENT RESPONSE OF SEMI-DWARF WHEAT UNDER IMPROVED MANAGEMENT CONDITIONS IN PAKISTAN: AGRONOMIC AND ECONOMIC IMPLICATIONS,
Colorado State Univ., Ft. Collins.
J. B. Eckert, N. M. Chaudhry, and S. A. Qureshi.
Agronomy Journal, Vol 70, No 1, p 77-80, January-February, 1978. 2 fig, 3 tab, 6 ref. AID Contract AID/ta-c-1100.

Descriptors: *Land management, *Crop production, *Economic impact, *Wheat, *Water resources development, Social aspects, *Irrigation programs, *Irrigation effects, *Water management(Applied), *On-site tests, Plant growth, *Water utilization, Soil-water-plant relationships, *Irrigation practices, Water supply, Water conservation, Soil moisture, *Pakistan

A series of experiments, conducted by Colorado State University agricultural research specialists, studied the plant growth of semi-dwarf wheat (Triticum aestivum L.), 1973-1975, at selected test sites in Lyallpur, Pakistan. Improvements made over traditional crop production included irrigation timing to minimize moisture stress during sensitive periods of plant growth, controlling amounts of water during each irrigation, and use of seed drills for row planting to control seed depth and spacing. Tests suggested wheat production could be maintained and/or improved by increasing the amount of fertilizer used and by reducing water used, provided that careful timing and control of irrigation programs was maintained. (Jewkes-Arizona)
W78-08741

DWARF WHEAT, GIANT CHANGES,
Agency for International Development, Washington, DC.
J. B. Eckert.
Agenda, Vol 1, No 4, p 9-15, April, 1978. 6 fig.

Descriptors: *Irrigation practices, Desalination processes, *Crop production, *Wheat, *Land reclamation, Water management(Applied), *Surface-groundwater relationships, Institutions, Planning, Evaluation, *Land management, *Water resources development, Research and development, Costs, *Governmental interrelations, *Land management, *Pakistan.

Pakistan's 1966 wheat crop production was 3.75 million tons. Through a series of land reclamation and improvement programs subsidized by AID loans and technical assistance, the Pakistan government encouraged farmers to plant dwarf wheat and to adopt new crop production techniques. Large-scale salinity control projects were undertaken to improve the land's productivity. Although Pakistan's annual wheat production had increased to 8.5 million tons by 1975, annual wheat production was still approximately 1 million tons by 1975, annual wheat production was still approximately 1 million tons less than the country's annual rate of consumption. Various marketing and distribution problems remained unsolved. In 1976, new AID assistance was authorized to assist Pakistan's government to purchase high-yield wheat seed, small scale farm equipment, fertilizer, and to develop project proposals to improve marketing techniques. (Jewkes-Arizona).
W78-08742

EFFECT OF GRAZED LUCERNE ON THE MOISTURE STATUS OF WHEAT GROWING SOILS,
New South Wales Dept. of Agriculture (Australia).
Tamworth Agricultural Research Center.
I. C. R. Holford, and A. D. Doyle.
Australian Journal of Experimental Agriculture and Animal Husbandry, Vol 18, No 90, p 112-117, Feb. 1978. 3 fig, 1 tab, 1- ref.

Descriptors: *On-site tests, *Australia, *Wheat, Crop production, *Soil moisture, Soil moisture meters, *Water loss, *Soil management, *Soil water, *Soil-water-plant relationships, Soil analysis, Grazing, *Alfalfa, Arid lands, Water shortage.

Two experiments studied the effects of varying the duration of lucerne ley and subsequent wheat cropping on selected black and red brown earth soils in northern New South Wales. Limited soil moisture hampers both crop and pasture growth in this region. On the black earth site, test results indicated soil moisture at 150 cm. had not been recharged in 28 months after the plough-out. On the red brown earth site, soil water at 200 cm. was recharged within 18 months, after a drought enforced fallow immediately following the lucerne plough-out. Results of both soil studies suggested a four to five month period of fallow after the lucerne plough-out was inadequate for sufficent soil moisture to accumulate, without causing reduced wheat yields in the next harvest. (Jewkes-Arizona)
W78-08744

AT HOME ON THE RANGE IN KENYA,
Agency for International Development, Washington, D.C.
E. George.
Agenda, Vol 1, No 5, p 16-20, May, 1978.

Descriptors: *Kenya, Nomads, Administrative agencies, *Direct costs, *Direct benefits, Multiple-purpose projects, *Range management, *Arid lands, *Grazing, *Livestock, Carrying capacity, *Cattle, Project planning, Water resources development, Regional development, Evaluation, *Economic justification, *Governmental interrelations.

A five-year program, designed to improve Kenya's range management and cattle production, is discussed. With funding assistance from the International Association of the World Bank, AID, Canada and the United Kingdom, the Kenya Ministry of Agriculture reorganized the Kalaliut Range Block, containing approximately 14 million arid acres, into 7 ranges. Construction and/or improvement of watering pans and borehles was instituted to improve water supplies available to nomadic herders. Suggested improvements made through the the project included: (1) construction and maintenance of new watering pans and boreholes; (2) successful raising of 76000 cattle; (3) development of new cattle markets; (4) construction of dry weather boundaries, access roads and firebreaks; and (5) study by 18 Kenyans for advanced degrees in veterinary sciences in the United States. Future project planning includes expansion of demonstration ranches and continued training of Kenyans in range/ranch management. (Jewkes-Arizona)
W78-08748

A MODEL FOR FORECASTING WHEAT PRODUCTION,
Vikram Sarabhai Space Center, Trivandrum (India).
K. A. P. Menon, and B. Bowonder.
Technological Forecasting and Social Change, Vol 11, No 3, p 261-271, March, 1978. 4 fig, 1 tab, 9 ref.

Descriptors: *Wheat, *Crop production, Simulation analysis, Planning, Arid lands, Costs, Rainfall-runoff relationships, Water supply, Water shortage, Irrigation practices, *Forecasting, Economic efficiency, *Model studies, Land management, Water conservation.

A proposed model for forecasting wheat production in arid regions of India considered the effects of irrigation, the use of fertilizer, the use of wheat varieties with drought tolerance, rainfall variations, labor and the use of farm machinery. This projected model demonstrated how simulation analysis could be used to predict the production of wheat. Rainfall effects and unexpected drought conditions produced variations in soil moisture retention and different levels in the water tables. Wheat production systems, emphasizing problems of wheat production and cultivation in India 1954-1972, were analyzed. Production costs, water conservation practices and crop productivity were compared. (Jewkes-Arizona)
W78-08751

THE EFFECT OF PLANT POPULATION, GROWING MEDIA, AND CARBON DIOXIDE CONCENTRATION ON THE GROWTH AND YIELD OF SOYBEANS GROWN IN A MODIFIED ENVIRONMENT,
Arizona Univ., Tucson. Dept. of Agronomy.
C. Samimy, and M. A. Massengale.
Journal of the Arizona-Nevada Academy of Science, Vol 13, No 1, p 25-28, February, 1978. 4 fig, 2 tab, 15 ref.

Descriptors: Environmental control, Growth chambers, Greenhouses, Plant populations, *Plant growth, *Plant growth regulators, *Soybeans, *Carbon dioxide, *Environmental effects, Crop production, Relationships, *Arid lands, Water shortage.

Two experiments, begun in 1966, compared soybeans grown in specially controlled greenhouse environment with soybeans grown under field conditions. Rates of plant growth, plant yield and water need for optimum plant growth were contrasted. The Kino cultivar of soybeans (Glycine max. (L.) Merr.) was used for all experiments. Experiment results suggested: (1) plants grown under greenhouse conditions showed almost identical growth patterns for plant emergence, flowering and maturing as plants grown under field conditions; (2) plants grown under greenhouse conditions needed appoximately 64 percent as much water as plants grown under field conditions; and (3) highest soybean crop production was obtained with greenhouse plants grown in 1200 ppm CO2 and in pure sand (4:0). Application of carbon dioxide concentrations increased number of pods per plant. These experiments were part of a larger project at the Institute of Atmospheric Physics, University of Arizona, designed to provide fresh

water, food, and energy to arid regions of the world. (JewkesoArizona)
W78-08753

TILLAGE EFFECTS ON WINTER WHEAT PRODUCTION WHERE IRRIGATED AND DRY-LAND CROPS ARE ALTERNATED,
Southwestern Great Plains Research Center, Bushland, TX.
P. W. Unger.
Agronomy Journal, Vol 69, No 6, p 944-950, November - December, 1977. 2 fig, 5 tab, 11 ref.

Descriptors: *Wheat, *Crop production, *Irrigation programs, *Irrigation effects, *Dry farming, *Tillage, *Water conservation, Soil management, Water utilization, *Water storage, Water supply, *Soil-water-plant relationships, Texas, Arid lands, Evaluation, On-site tests.

Study was conducted at the USDA Southwestern Great Plains Research Center, Bushland, Texas, 1971-1975, to determine if wheat yields could be increased where irrigated and dryland wheat crops are alternated on the same plots. Tillage methods tested included no-tillage, sweep and disc tillage. A detailed summary compared various effects of the cropping systems and tillage effects, together with an evaluation of the combined effects of the cropping systems and the tillage methods on winter wheat production. Test results suggested: (1) dryland wheat yielded significantly more grain with sweep or disc tillage in the irrigated and dryland system than in the continuous dryland system; (2) sweep tillage was best method for irrigated wheat; and (3) water efficiency was 8.5 percent greater when irrigated and dryland crops were alternated. Greater potential grain production was also possible when dryland and irrigated crops were alternated. (Jewkes-Arizona)
W78-08754

ESTABLISHING SOIL LOSS AND SEDIMENT YIELD LIMITS FOR AGRICULTURAL LAND,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 4D.
W78-08793

VEGETATIVE WATER EROSION CONTROL FOR AGRICULTURAL AREAS,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
For primary bibliographic entry see Field 4D.
W78-08795

MECHANICAL EROSION CONTROL FOR AGRICULTURAL AREAS,
Soil Conservation Service, Lincoln, IL.
For primary bibliographic entry see Field 4D.
W78-08796

EROSION AND SEDIMENTATION ON IRRIGATED LANDS,
Agricultural Research Service, Kimberly, ID. Snake River Conservation Research Center.
For primary bibliographic entry see Field 4D.
W78-08800

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

OSO CREEK FLOOD CONTROL PROJECT AREA, NUECES COUNTY, TEXAS: A REPORT ON THE ARCHAEOLOGICAL AND HISTORICAL RESOURCES,
Texas Univ. at Austin, TX.
P. E. Patterson, and N. M. Lord.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 445, Price codes: A04 in paper copy, A01 in microfiche. Research Report No. 35, April, 1974. 60 p, 6 fig, 14 ref, append.

Descriptors: *Flood control, *Archaeology, *Texas, *Environmental effects, History, Land use, *Archaeological effects, Archaeological resources.

The results of a reconnaissance directed toward evaluating the archaeological and historical resources to be affected by proposed modifications for flood control on Oso Creek, Petronila Creek, and drainage ditches in the area of Robstown, Texas, are reported. An examination of the land surface in the study area yielded evidence of a total of 68 newly discovered and previously recorded sites. Ten archaeological sites will be affected by these proposed modifications. No significant historic sites were found within the study area. Recommendations are presented for the mitigation of the loss or damage of the archaeological resources that are endangered. No sites, prehistoric or historic, listed on, nominated to, or approved for submission to the National Register of Historic Places were found within the study area. (Seip-IPA)
W78-08229

STATE WATER CONSERVATION PROJECTS.
Montana Dept. of Natural Resources and Conservation, Helena. Engineering Bureau.
For primary bibliographic entry see Field 6E.
W78-08235

REMOTE SENSING INPUTS TO LANDSCAPE MODELS WHICH PREDICT FUTURE SPATIAL LAND USE PATTERNS FOR HYDROLOGIC MODELS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
L. D. Miller, C. Tom, and K. Nualchawee.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-25607, Price codes: A03 in paper copy, A01 in microfiche. Report, May, 1977. 41 p, 22 fig, 10 tab, 9 ref.

Descriptors: *Land use, *Topographic mapping, *Urban mapping, *Urban hydrology, *Remote sensing, *Terrain analysis, *Model studies, *Hydrologic data, Analytical techniques, Watersheds, Colorado, Tropical regions, *Denver(Colo), Landscaping, *Landscape model studies, *Land use patterns, *Tropical hydrology, Thailand.

Landscape modeling organizes and overlays information from existing maps, tabular sources, and from the analysis of remote sensing imagery into a computer framework. This critical endeavor provides higher-order inputs to the hydrological analysis of an area. Landscape modeling with attendant inputs from remote sensing is illustrated by two case studies. Application to the Denver, Colorado, urban area typifies use of he procedure to predict future spatial evolution of man-induced land use patterns of an urban area which can assist in the simulation of future urban hydrographs. A tropical forest site in Thailand illustrates application to more natural watersheds as the basis for analysis of the hydrological implications of alteration of land cover; primitive watersheds subject to change due to natural (e.g., drought) or man-made (e.g., forest cutting) alteration can be modeled to yield map-like projections of the future distribution of each land use or cover. Remote sensing imagery subjected to proper computer analysis provides input to hydrological models and practical data bases for planning large and small-scale hydrological developments. Combining available remote sensing imagery with map information in the landscape model substantially improves these applications. Coincident, registered overlays of the map information upon multispectral remote sensing imagery of Landsat provide a basis for marked improvements in the accuracy of the computer interpretation of land use and land cover maps to be used directly in hydrological analysis. (Seip-IPA)
W78-08236

AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA USING REMOTE SENSING TECHNIQUES,
California Univ., Berkeley.
R. N. Colwell.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-31569, Price codes: A14 in paper copy, A01 in microfiche. Progress Report, Space Sciences Laboratory Series 18, Issue 44, May 31, 1977. 234 p, 92 fig, 40 tab, 61 ref, 7 append. NCL 05-003-404.

Descriptors: *Water supply, *Water demand, *California, *Remote sensing, Water resources, *Water resources development, Mapping, Social aspects, Political aspects, Procedures, Evaporation, Transportation, Precipitation(Atmospheric), Snowmelt, Agriculture, *Management, Procedural manuals, Cropland.

A multi-campus study investigated two aspects of California's water resources: (1) problems pertaining to water supply in northern California, and (2) problems pertaining to water demand in central and southern regions. The socioeconomic, cultural, and political considerations that relate to the management of California's water resources were studied. Modern remote sensing techniques and the preparation of procedural manuals for optimal utilization of remote sensing in the inventory and management of resources are described in detail. The application of remote sensing is described for several hydrologic parameters: evapo-transpiration, precipitation, snowmelt runoff, areal extent of snow, agricultural water demand, cropland information, and irrigation requirements. Software and hardware requirements and utilization are documented. Two special studies are presented: (1) Reaction to Reflections on the First Conference on the Economics of Remote Sensing Information Systems, and (2) The Increasing Need for Water Resource Information in California. (Seip-IPA)
W78-08244

WEATHER AND WATER.
World Meteorological Organization, Geneva (Switzerland).
For primary bibliographic entry see Field 2B.
W78-08245

THE STABILITY OF PARAMETER ESTIMATION IN THE GENERAL LINEAR MODEL,
Ireland Office of Public Works, Dublin.
For primary bibliographic entry see Field 2A.
W78-08282

TIME-SYNCHRONISED STAGE RECORDERS FOR THE MONITORING OF INCREMENTAL DISCHARGE INPUTS IN SMALL STREAMS,
Bristol Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2E.
W78-08284

SIMULATION OF THE HYDROLOGIC CYCLE USING ATMOSPHERIC WATER VAPOR TRANSPORT DATA,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 2A.
W78-08285

DILUTION GAUGING ON THE RECESSION LIMB: 2. THE INTEGRATION METHOD,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2E.

W78-08289

RESERVOIR SEDIMENTATION UNDER UNCERTAINTY: ANALYTIC APPROACH VERSUS SIMULATION,
Water Resources Center, Budapest (Hungary).
For primary bibliographic entry see Field 2J.
W78-08292

THE USE OF GEOMETRIC PROGRAMMING IN THE DESIGN OF AN ALGERIAN WATER CONVEYANCE SYSTEM,
Becht Corp., San Francisco, CA.
F. P. Wyman.
Interfaces, Vol. 8, No. 3, p 1-5, May 1978. 2 fig, append.

Descriptors: *Water projects, *Cost minimization, *Design, *Water conveyance, *Algeria, Optimization, Sensitivity analysis, *Geometric programming, Agriculture, Pipes, Diameter, Pumping stations, Feasibility, Economic efficiency, Mathematical models, Operations research, Irrigation water.

Algeria is presently involved in an ambitious program to improve its agricultural self-sufficiently. Geometric programming (GP), an engineering optimization tool, has been receiving increased academic attention and has had numerous suggestions for its use proposed; however, few actual applications of GP have been documented. This article reports an application of the technique and the effective use of a simple sensitivity analysis. The project considered will bring water to the inland Setif Region of Algeria from several rivers flowing north into the Mediterranean; it involves pumping water south, up over the mountains, directing it by a series of pipelines, tunnels, and pumping stations, to a set of retention reservoirs, and then distributing it to an agricultural irrigation system. The problem solved is to derive the least cost pipe diameter and number of pumping stations, given a specified flow rate, for selected segments of the pipeline system. Results show that a conservatively estimated savings of $50 million in project costs is expected as a result of the use of GP in designing a 27-kilometer agricultural water conveyance system in Algeria. (Graf-Cornell)
W78-08308

SOUTH DAKOTA'S RESPONSE TO THE 'WATER CRISIS': AN ANALYSIS OF ALTERNATIVES,
For primary bibliographic entry see Field 6E.
W78-08339

LEGISLATIVE AND JUDICIAL ATTENTION TO STREAM MODIFICATION: CHANNELIZATION, ITS EFFECTS AND ALTERNATIVES,
Syracuse Univ., NY. School of Law.
For primary bibliographic entry see Field 6E.
W78-08343

THE POTENTIAL EFFECTS OF CLEARING AND SNAGGING ON STREAM ECOSYSTEMS,
Kansas State Univ., Manhattan. Div. of Biology.
For primary bibliographic entry see Field 5C.
W78-08358

THE SANIBEL REPORT: FORMULATION OF A COMPREHENSIVE PLAN BASED ON NATURAL SYSTEMS,
Conservation Foundation, Washington, DC.
For primary bibliographic entry see Field 6B.
W78-08398

ANALYSIS OF EXPENDITURES FOR OUTDOOR RECREATION AT THE MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM,
Oklahoma Agricultural Experiment Station, Stillwater.
For primary bibliographic entry see Field 6B.
W78-08424

MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM; HYDROELECTRIC POWER GENERATION.
Institute for Water Resources (Army), Fort Belvoir, VA.
For primary bibliographic entry see Field 8C.
W78-08425

POPULATION CHANGE, MIGRATION AND DISPLACEMENT ALONG THE MCCLELLAN-KERR RIVER NAVIGATION SYSTEM,
Missouri Univ.-Columbia. Dept. of Sociology.
For primary bibliographic entry see Field 6B.
W78-08426

MULTI-OBJECTIVE PLANNING FOR WATER RESOURCES MANAGEMENT,
Melbourne Univ., Parkville (Australia). Centre for Environmental Studies.
For primary bibliographic entry see Field 6B.
W78-08429

MULTI-OBJECTIVE PLANNING FOR WATER RESOURCES MANAGEMENT - REVIEW OF RECENT DEVELOPMENTS IN THE U.S.A.,
Melbourne Univ., Parkville (Australia). Centre for Environmental Studies.
For primary bibliographic entry see Field 6A.
W78-08430

HANDBOOK OF WATER RESOURCES AND POLLUTION CONTROL.
For primary bibliographic entry see Field 5D.
W78-08543

A NEW APPROACH TO FULLY GRAPHICAL (DIMENSIONAL) SOLUTION OF THE COLEBROOK-WHITE FUNCTION,
University of Strathclyde, Glasgow (Scotland). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-08552

CRITICAL FLOW IN RIVERS WITH FLOOD PLAINS,
LaLonde, Girouard, Letendre and Associates, Montreal (Quebec).
For primary bibliographic entry see Field 2E.
W78-08568

RIVER TRANSPORT MODELING FOR UNSTEADY FLOWS,
Sutron Corp., Arlington, VA.
For primary bibliographic entry see Field 2E.
W78-08569

EFFECT OF RESERVOIRS ON THE DEGREE OF RIVER RUNOFF REGULATION IN THE USSR,
V. A. Bakhriarov, and V. A. Veynert.
Soviet Hydrology: Selected Papers, Vol. 15, No. 3, p 179-183, 1976. 2 tab, 11 ref. Translated from Trudy IV Vsesoyuznogo Gidrologicheskogo S'yezda, Vol. 5, No p 53-62, 1975.

Descriptors: *Reservoirs, *River regulation, *Runoff, Europe, Effects, Storage, Rivers, Flow, River flow, Variability, Watersheds(Basins), Data processing, Runoff coefficient, Hydrology, *Reservoir operation, *USSR.

The natural runoff regime of all rivers reflects a certain degree of regulation in intra-annual and long-period runoff fluctuations. Regulation is increased by reservoirs. Virtually total runoff regulation to the long-period mean discharge can be achieved with very large useful reservoir storages. The useful reservoir storage required to achieve a given runoff regulation level depends on the irregularity of intra-annual and long-period runoff. The greater this irregularity, the greater the storage needed for a given degree of regulation. In one of the investigations of the rivers of the lowland part of the European USSR, intra-annual regulation (coefficient phi) was determined by multiple linear correlation. As an index of the degree of runoff regulation by reservoirs, the generally accepted regulation coefficient alpha which is the ratio of regulated discharge Q to long-period mean discharge Q, was used. For the 27 rivers that were studied with 92 accounted-for reservoirs with a total useful storage of 1076 cu km (with an annual runoff at outlet gaging stations of 2564 cu km), the regulation coefficient averaged 0.74. To increase the degree of regulation to 0.95, i.e., by 0.21, the total storage must be increased by 2354 cu km, or by a factor of 2 by comparison with the storage of the reservoirs taken into account. To regulate runoff in the 20 rivers on which there are no reservoirs and no reservoirs are planned, to alpha = 0.70 would require a total storage of 294 cu km and to alpha = 0.95 a storage of 1461 cu km for a total annual runoff at outlet gaging stations of 772 cu km. (Sims-ISWS)
W78-08571

METHOD FOR COMPUTING (BY COMPUTER) THE RETRANSFORMATION OF FLOOD RUNOFF HYDROGRAPHS FOR RIVERS REGULATED BY A CASCADE OF RESERVOIRS (AS EXEMPLIFIED BY THE VOLGA-KAMA CASCADE),
G. A. Shuvayev, and B. S. Tseytlin.
Soviet Hydrology: Selected Papers, Vol. 15, No. 2, p 133-137, 1976. 1 fig, 2 tab, 3 ref. Translated from Transactions of the IV All-Union Hydrologic Conference (Trudy IV Vsesoyuznogo gidrologicheskogo s'yezda), Vol. 3, p 350-359, 1975.

Descriptors: *Hydrograph analysis, *Mathematical models, *Runoff, *Regulated flow, River flow, Flood flow, Hydraulics, Analysis, Analytical techniques, Hydrographs, Foreign research, Flood stages, Flood flow, Spring, *USSR(Volga-Kama Cascade).

The hydraulic method of retransforming hydrographs regulated by a cascade of reservoirs consists of computing the unsteady movement of the flood wave. Natural input hydrographs of the flood along the main trunk of a river, its major tributaries, and of lateral inflow were used as initial data, as well as the hydraulic and volumetric channel and floodplain characteristics within the stretch of the river being investigated. The unsteady movement of a flood wave was computed by the method of instantaneous regimes with allowance for the inertial terms of the dynamic equation. This method was based on the approximate solution in finite differences of differential equations of unsteady motion (St. Venant), represented by equations of dynamic equilibrium and continuity of flow. A comparison of the hydrographs computed for 1926 and 1937 with the observed hydrographs showed fairly close agreement. Tabulated were the tentative values of the corrections for floodplain accumulation in the Tetyshi-Volgograd reach of the Volga, by which the maximum discharges and runoff volume of the retransformed flood hydrographs at Volgograd city must be reduced. (Humphreys-ISWS)
W78-08572

REGIONALIZATION OF THE USSR ACCORDING TO COPHASED ANNUAL RIVER RUNOFF FLUCTUATIONS,
For primary bibliographic entry see Field 2E.

W78-08573

INVESTIGATION OF THE MAXIMUM RUNOFF OF RIVERS IN THE SOVIET FAR EAST,
For primary bibliographic entry see Field 2E.
W78-08574

COMPUTATION OF THE RAIN RUNOFF OF UNSTUDIED RIVERS IN THE USSR,
A. I. Chebotarev, and B. I. Serpik.
Soviet Hydrology: Selected Papers, Vol. 15, No. 2, p 86-90, 1976. 4 tab, 12 ref. Translated from Transactions of the IV All-Union Hydrologic Conference (Trudy IV Vsesoyuznogo gidrologicheskogo s'yezda), Vol. 3, p 22-30, 1975.

Descriptors: *Rainfall-runoff relationships, *Watersheds(Basins), *Runoff, *Peak discharge, Flood discharge, Floods, Hydrology, Discharge(Water), Foreign research, Rational formula, Runoff coefficient, *Runoff forecasting, Equations, Rivers, Mathematical models, *USSR, Unstudied rivers.

Two groups of methods are used at the present time (1975) to compute maximum flood runoff: methods based on genetic runoff formulas, and methods based on empirical relations characterizing particular patterns under specific physiographic conditions. Rivers with basin areas greater than 100-200 sq km are adequately covered by observations, while there are very few data on rivers with smaller basins. Therefore, one of the variants of genetic formulas, i.e., the formula of limiting runoff rate, was selected for computing the maximum rain runoff of unstudied small rivers (50-200 sq km) and the empirical reduction formula for larger rivers. It is difficult and arbitrary to verify the agreement between the maximum runoff rates computed from the limiting runoff rate formula and observed values because of the absence of sufficiently reliable observational data on the maximum runoff of small drainage basins. Comparison of the computed maxima with the maxima established from high water marks showed satisfactory agreement.--Humphreys-ISWS)
W78-08575

PROBLEMS OF THE THEORY OF FLASH FLOOD FORMATION IN THE RIVERS OF THE PERMAFROST ZONE,
For primary bibliographic entry see Field 2E.
W78-08576

METHOD OF LINING A WATERWAY OR RESERVOIR,
D. A. Young.
U.S. Patent No. 4,065,924, 4 p, 2 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 966, no 1, p 46, January 3, 1978.

Descriptors: *Patents, Bodies of water, *Sealants, *Seepage control, Seepage, Linings, Soil sealants, Water control, Water loss.

A method of lining a waterway or reservoir includes laminating a layer of a flexible and liquid impervious material with a layer of fibrous material, applying to the lamination to cover at least part of the surface of the waterway or reservoir with the bibrous material exposed, and applying to the exposed fibrous material a layer of a rigidly or semi-rigidly settable composition. The steps can be repeated successively and a join effected between adjacent lining sections. The laminate may have its flexible and liquid impervious material of butyl, nitrole rubber, neoprene, etc, or combinations. The layer of fibrous material may be polyester, polypropylene, or nylon fiber. The rigidly or semi-rigidly settable compsition may be cement, bitumen, asphalt or combinations or with an epoxy resin as a binder. One of the advantages is that if after the passage of time the concrete lining cracks then liquid will not escape into the surrounding ground because the flexible liquid impervious underlayer forms a barrier. (Sinha - OEIS)
W78-08599

UNDERGROUND DRAINAGE PIPE,
R. S. Auriemma.
U.S. Patent No. 4,065,925, 7 p, 10 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 966, No 1, p 46-47, January 3, 1978.

Descriptors: *Patents, *Subsurface drainage, *Controlled drainage, Drainage systems, *Drains, Subsurface drains, Storm drains, Pipes.

The invention relates to an underground drainage pipe of the type used to remove excess soil water. The underground drainage pipe includes a water-receiving trough, a roof covering the trough and joining the trough at the trough lips are wings extending outward and downward from the junction between the trough and roof. Water intake holes extend through the thickness of the trough beneath the wings. The wings prevent clogging of the intake holes. Additionally the pipe includes specialized strengthened junctions between the trough and roof which enable the pipe may be joined together in the field without impairing the fluid-carrying capacity or drainage capacity by integral interfitting joints. (Sinha-OEIS)
W78-08600

DRAINAGE LAW ASSISTS LAND DRAINAGE,
Guelph Univ. (Ontario). Dept. of Engineering.
For primary bibliographic entry see Field 6E.
W78-08722

PHASE II, ARIZONA STATE WATER PLAN: ALTERNATIVE FUTURES,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 6B.
W78-08725

A WATER SUPPLY DATA BASE,
Arizona Univ., Tucson. Management Information Systems.
For primary bibliographic entry see Field 7C.
W78-08726

ARIZONA WATER POLICY: CHANGING DECISION AGENDAS AND POLITICAL STYLES,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 6E.
W78-08727

AN ECONOMIC ANALYSIS OF THE CENTRAL ARIZONA PROJECT,
Arizona Univ., Tucson. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-08728

A UTILITY CRITERION FOR REAL-TIME RESERVOIR OPERATION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources; and Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
L. Duckstein, and R. Krzysztofowicz.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 7. Proceedings, Meetings of the American Water Resources Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, April 15-16, 1977. Las Vegas, Nevada, p. 207-218. 4 fig, 5 tab, 14 ref.

Descriptors: *Model studies, Water resources, Planning, *Administration, Mathematical models, Statistical models, *Risks, *Flood control, Water control, Water supply, *Reservoir operation, Reservoir releases.

A dual purpose reservoir control problem can be logically modeled as a game against nature. The first purpose of a reservoir is flood control under uncertain inflow, which corresponds to short range operation (SRO); the second purpose, which the present model imbeds into the first one, is water supply after the flood has receded, and corresponds to longrange operation (LRO). The reservoir manager makes release decisions based on his SRO risk. The trade-offs involved are described by a utility function constructed within the framework of Keeney's multi-attribute utility theory. The underlying assumptions appear to be quite natural for the reservoir control problem. To test the model, an experiment assessing the utility criterion of individuals was performed; results tend to confirm the plausibility of this approach. In particular, most individuals appear to have a risk-averse attitude for small floods and a risk-taking attitude for large floods. (Payton-Arizona)
W78-08732

REPLANTING PAKISTAN'S FOREST: TREE BY TREE.
Agency of International Development, Karachi (Pakistan).
For primary bibliographic entry see Field 4D.
W78-08737

4B. Groundwater Management

DIURNAL PERIODICITY IN GROUND-WATER RECHARGE RATES,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
S. N. Webb, and K. K. Watson.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 104, No IR1, Proceedings Paper 13613, March 1978. 2 fig, 1 tab, 11 ref.

Descriptors: *Groundwater recharge, *Groundwater, *Algae, *Permeability, *Pore pressure, *Diurnal, Frequency, Pore water, Pit recharge, Oxygen, Clogging, Artificial recharge, On-site tests, Hydraulic conductivity, *Australia.

In an investigation of the flow characteristics of a recharge pit used for artificial groundwater recharge purposes, diurnal variations of a cyclic nature were detected in the intake rate. The output from soil water pressure sensors installed between the base of the pit and the water table indicated similar cyclic variations. The maximum intake rate occurred regularly each day at approximately 2 a.m. - 3 a.m. and the minimum approximately 12 hr later. It was concluded that these variations are due to the activity of algae on the base of the pit and in the top layer of sand. Diurnal peaks and troughs of the algae oxygen production result in changes in the hydraulic conductivity of the profile. This would appear to be related to changes in the volume of the occluded oxygen which exists as bubbles in the soil pores. These reduce the flow area available for recharge and thus cause a reduction in the intake rate. (Visocky-ISWS)
W78-08274

SOLUTE TRAVEL TIMES TO WELLS IN SINGLE OR MULTIPLE LAYERED AQUIFERS,
Iowa Agriculture and Home Economics Experimental Station, Ames.
For primary bibliographic entry see Field 2F.
W78-08288

DETERMINATION OF AQUIFER PARAMETERS FOR A MULTIPLE WELL SYSTEM,
Middle East Technical Univ., Ankara (Turkey). Dept. of Engineering Sciences.
For primary bibliographic entry see Field 2F.
W78-08290

A MATHEMATICAL MODEL OF STRATIFIED GROUNDWATER FLOW,
Egyptian Desert Inst., Cairo. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-08291

USE OF TRACERS TO CONFIRM GROUNDWATER FLOW,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, NY. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5B.
W78-08296

UNDERGROUND RESERVOIRS TO CONTROL THE WATER CYCLE,
Food and Agriculture Organization of the United Nations, Rome (Italy).
R. P. Ambroggi.
Ground Water, Vol 16, No 3, p 158-166, May-June 1978. 6 fig, 3 ref.

Descriptors: *Groundwater, *Aquifers, *Recharge, *Water resources, Storage, Water storage, Pumping, Groundwater recharge, Natural recharge, Artificial recharge, Agriculture, Irrigation, Food abundance, Water supply, Water cycle.

At any one time perhaps 2/3's of the freshwater on the earth is held in underground reservoirs. These reservoirs could be much more intensively drawn on, to be refilled when water is plentiful. On a global scale, the problem facing mankind is not a lack of freshwater but a lack of efficient regimes for using the water that is available. The need to produce more food will continue, and the need can be met only by an assured supply of water in agricultural areas. The water deficit of 400 cu km that caused the food crisis of 1972 is insignificant when one considers that about 45,000 cu km of water is still in storage in the top 30 m of groundwater reservoirs. Mankind can solve the water problem if governments and decision makers are prepared to embark on the proper management of their water resources, particularly of their reserves of groundwater. Moreover, it is becoming technologically feasible to deal with such adverse developments as water deficiencies resulting from changes in weather patterns by initiating the large-scale and long-term control of the water cycle through groundwater reservoirs. (Sims-ISWS)
W78-08297

HYDROLOGIC AND ECOLOGIC INVENTORIES OF THE COASTAL WATERS OF WEST HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 2L.
W78-08311

COMMAND POST AT ANDRADE,
G. G. Sykes.
The Journal of Arizona History, Vol 19, No 1, p 73-90, Spring, 1978.

Descriptors: *Colorado River, *Arizona, *Irrigation systems, Distribution systems, Irrigation districts, *California, Irrigation engineering, Irrigation canals, Discharge(Water), Flow system, Water delivery, Levels, Dams, History, Flood control, Imperial Valley.

From 1906 and throughout the 1930's the Andrade station served as headquarters of the Imperial Irrigation District. Located on the Colorado River near Yuma, Arizona, the Andrade station had the responsibility for regulating the flow of irrigation water diverted from the Colorado River at this point for delivery to the farm lands of the Imperial Valley, California. Levee construction for flood control was another important function of the station. This report summarizes significant problems occurring during the 1920's pertaining to passage of irrigation water and levee construction and maintenance. (Jewkes-Arizona)
W78-08371

GROUND WATER MANUAL, A GUIDE FOR THE INVESTIGATION, DEVELOPMENT, AND MANAGEMENT OF GROUND-WATER RESOURCES.
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 2F.
W78-08542

EXACT SOLUTIONS FOR TWO-DIMENSIONAL GROUNDWATER FLOW PROBLEMS INVOLVING A SEMI-PERVIOUS BOUNDARY,
Rijkswaterstaat, Rijswijk (Netherlands). Data Processing Div.
For primary bibliographic entry see Field 2F.
W78-08547

NITRATE, CHLORIDE AND DISSOLVED SOLIDS, OGALLALA AQUIFER, WEST TEXAS,
Texas Tech Univ., Lubbock. Dept. of Geosciences.
For primary bibliographic entry see Field 5B.
W78-08555

RESULTS OF PUMPING TESTS IN CRYSTALLINE-ROCK AQUIFERS,
Geraghty and Miller, Inc., Tampa, FL.
V. W. Uhl, Jr., and G. K. Sharma.
Ground Water, Vol. 16, No. 3, p 192-203, May-June 1978. 8 fig, 2 tab, 16 ref.

Descriptors: *Pumping, *Aquifer testing, *Crystalline rocks, Granites, Metamorphic rocks, Aquifer characteristics, Transmissivity, Graphical analysis, Data collections, Drawdown, Groundwater recharge, Leakage, Dewatering, Hydrogeology, Theis equation, India, Step tests, Rorabaugh method, Cooper-Jacob method, Non-Darcian flow.

The Evangelical Lutheran Church (E. L. C.) water Development Project, headquartered in Betul, Madhya Pradesh, India, had been involved since 1971 in developing groundwater supplies in the Satpura Hill Region of Central India. To date, over 400 wells have been drilled in crystalline rocks, and more than 100 of these wells have been pumptested to determine aquifer hydrologic characteristics. Crystalline rocks crop out in roughly 20% of the Satpura Hill Region, and the main rock types are granite, gneiss, and schist. The controlled testing and detailed analysis of over 100 pumping tests provided an excellent opportunity to evaluate the applicability of standard analytical models for the analysis of pumping tests in crystalline-rock aquifers. Step-test data were analyzed by Rorabaugh's method and by a graphical method. The results indicated that well losses are significant in a number of wells tested and appear to be related to non-Darcian flow in the aquifer adjacent to a pumped well. Constant-rate pumping tests were used to determine aquifer transmissivity. Time-drawndown data were analyzed by the Cooper-Jacob Approximation to the Theis equation, and recovery data were analyzed by the residual drawdown method. (Visocky-ISWS)
W78-08556

IMPACT OF ENERGY DEVELOPMENT ON GROUND WATER,
American Society of Civil Engineers, New York. Hydraulics Div.
For primary bibliographic entry see Field 5B.
W78-08566

HYDROGEOLOGY OF THE MEDICINE HAT AREA, ALBERTA,
Research Council of Alberta, Edmonton.
D. R. Stevenson, and D. M. Borneuf.
Report 75-2, 1977. 11 p, 2 tab, 21 ref. $2.00.

Descriptors: *Hydrogeology, *Canada, *Groundwater, Geologic mapping, Aquifers, Groundwater movement, Groundwater resources, Water wells, Pumping, Water yield, Transmissivity, Base flow, Geochemistry, Dissolved solids, *Alberta(Canada).

The Medicine Hat map area is predominantly flat, with rolling hills in the central, eastern, and northern parts of the region; the South Saskatchewan, Red Deer and Bow Rivers cut deeply incised valleys into the plains surface. The great majority of wells produce water from the Oldman Formation. However, a wide and deep bedrock valley which runs from the south central part of the map area to the northeast corner could possibly provide yields of 1 to 500 igpm (0.1 to 38 l/sec) from gravels resting on the bedrock. Total dissolved solids contents of groundwater over the map area vary from 1,000 to 3,000 mg/l. Water types are sodium bicarbonate in the channels, sodium sulfate in lowland surficial aquifers, calcium bicarbonate in uplands; deep Foremost Formation aquifers are of sodium sulfate type and brackish. (Visocky-ISWS)
W78-08580

WATER WELL MONITOR,
G. M. Campbell.
U.S. Patent No. 4,065,226, 5 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 965, no 4, p 1438, December 27, 1977.

Descriptors: *Patents, *Water wells, *Water levels, *Water supply, Monitoring, Equipment.

The object of this invention is to provide a means by which the height of the water in a well may be indicated directly and read off easily. The invention provides means to shut off a motor driving a pump before the water level in the well falls below a safe level to protect the pump from burning out and/or pumping air, and means to return the motor or operative condition when the water level has risen sufficiently to resume pumping. The apparatus consists of float and weight means operating a depth indicator and a cutoff switch. (Sinha-OEIS)
W78-08593

OIL WELL OPERATION AND SALT-WATER INTRUSION: POLICY IMPLICATIONS,
Cities Service Oil Co., Charleston, WV.
For primary bibliographic entry see Field 5G.
W78-08617

MIGRATION OF EXPLOSIVES AND CHLORINATED PESTICIDES IN A SIMULATED SANITARY LANDFILL,
Construction Engineering Research Lab. (Army). Champaign, IL.
For primary bibliographic entry see Field 5B.
W78-08656

IRRIGATION WASTEWATER DISPOSAL WELL STUDIES-SNAKE PLAIN AQUIFER,
Idaho Dept. of Water Resources, Boise.
For primary bibliographic entry see Field 5B.
W78-08724

PHASE II, ARIZONA STATE WATER PLAN: ALTERNATIVE FUTURES,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 6B.
W78-08725

ALTERNATIVE ENERGY SOURCES IN THE USSR,
Royal Swedish Academy of Science (Stockholm).
For primary bibliographic entry see Field 3F.
W78-08736

4C. Effects On Water Of Man's Non-Water Activities

CHEMICAL CONTROL OF BRUSH AND ENVIRONMENTAL SAFETY OF ROADSIDE VEGETATION MANAGEMENT CHEMICALS,
Purdue Univ., Lafayette, IN. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5G.
W78-08224

REMOTE SENSING OF EFFECTS OF LAND USE PRACTICES ON WATER QUALITY,
Kentucky Univ., Lexington. Dept. Forestry.
For primary bibliographic entry see Field 5B.
W78-08237

UTILIZATION OF WOOD RESIDUES FOR HIGHWAY SLOPE STABILIZATION IN NORTH CAROLINA,
North Carolina State Univ., at Raleigh. Highway Research Program.
For primary bibliographic entry see Field 4D.
W78-08581

IMPACT OF NEARSTREAM VEGETATION AND STREAM MORPHOLOGTY ON WATER QUALITY AND STREAM BIOTA,
Illinois Univ. at Urbana-Champaign. Dept. of Ecology, Ethology and Evolution.
For primary bibliographic entry see Field 5G.
W78-08634

EFFECTS OF BRUSH TO GRASS CONVERSION ON THE HYDROLOGY AND EROSION OF A SEMIARID SOUTHWESTERN RANGELAND WATERSHED,
Agricultural Research Service, Tucson. AZ. Southwest Watershed Research Center.
For primary bibliographic entry see Field 4D.
W78-08735

RECLAMATION OF COAL-MINED LAND IN THE SOUTHWEST,
Rocky Mountain Experiment Station, Denver, CO.
E. F. Aldon.
Journal of Soil and Water Conservation, Vol 33, No 2, p 75-79, March-April, 1978.

Descriptors: *Land reclamation, Irrigation practices, On-site tests, Arid climates, *Arizona, *New Mexico, Vegetation, Revegetation, *Coal mines, Mulching, Fertilizers, Soil management, Plant growth, Soil erosion, Water supply, Water resources development.

Current problems in reclamation of arid coal-mined areas of the southwestern United States are summarized, with emphasis on the Black Mesa area of northeastern Arizona and San Juan Basin in northwestern New Mexico. Questions of soil erosion, arid climate, water resources, and revegetation are discussed. For arid mine spoils, successful revegetation techniques have included the planting of alkali sacaton, western wheatgrass, fourwing saltbush, Indian rice grass and pinyon pines. Plantings at experimental test sites are described, including suggested mulches, fertilizers, and irrigation procedures to improve soil quality. (Jewkes-Arizona)
W78-08750

4D. Watershed Protection

BASIN DYNAMICS, CHANNEL PROCESSES, AND PLACER FORMATION: A MODEL STUDY,
Victoria Univ., Wellington (New Zealand).
For primary bibliographic entry see Field 2J.
W78-08273

SENSIBILITY OF PARAMETERS OF THE SSARR MODEL (SENSIBILITE DES PARAMETRES DU MODELE SSARR),
Hydro-Quebec, Montreal. Service Hydraulique.
For primary bibliographic entry see Field 2A.
W78-08293

THE ROAD TO EROSION--A CAUTIONARY TALE,
California Univ., Berkeley. Dept. of Conservation and Resource Studies.
R. N. Coats.
Environment, Vol. 20, No. 1, p 16-20, 37-38 (January-February, 1978). 1 fig, 1 tab.

Descriptors: *Erosion control, *Erosion, *California, *Environmental effects, *Forest watersheds, Silting, Sedimentation, Watersheds(Basins), Precipitation(Atmospheric), Clear-cutting, Sheet erosion, Gully erosion, Landslides, Stream erosion, Runoff, Sediments, Environmental control, Fisheries, Water resources development, Federal Water Pollution Control Act, Sediment control.

A combination of intense precipitation, high peak flows, human impacts, and structurally unstable rock has resulted in an extremely high erosion rate for te river basins of California's North Coastal Region. This article estimates the impact of human activity and explains the processes involved in erosion. There is an attempt to identify specific sources of sediment so that it can be controlled. The role of logging is discussed and it appears to be a substantial source of sediment. The environmental impacts of accelerated erosion have proven to be detrimental to fisheries, recreation, beneficial use of water, and possibly forest productivity. In an attempt to control future erosion, regulatory remedies have been implemented to halt the devastating impact of logging on natural resources. Most attempts to regulate private activities for the public good either prescribe certain behavior or prescribe certain standards. The article explores weahnesses of the Forest Practice Act and calls for future public subsidies to private land owners to insure proper regulation of activities that lead to high erosion rates. (Quarles-Florida)
W78-08332

EROSIONAL REMOVAL OF FALLOUT PLUTONIUM FROM A LARGE MIDWESTERN WATERSHED,
Argonne National Lab., IL. Radiological and Environmental Research Div.
D. G. Sprugel, and G. E. Bartelt.
Journal of Environmental Quality, Vol. 7, No. 2, p 175-177, April-June 1978. 2 tab, 28 ref.

Descriptors: *Erosion, *Sediments, *Plutonium, Watersheds(Basins), Sampling, Data processing, Sediment transport, Sorption, Soils, Soil erosion, Suspended solids, Runoff, Radioisotopes, Agriculture, Sedimentology.

The Great Miami River at Sidney, Ohio, drains a 1,401-sq km watershed which is generally flat and predominantly agricultural. Samples of river water collected over a wide range of flow and sediment loading conditions showed that the concentrations of 239, 240 Pu in filtered water and suspended sediment were fairly constant, which means of 0.15 fCi/liter for water and 14 fCi/g for suspended sediment. Plutonium concentrations in suspended sediment are somewhat higher than plow-layer soil concentrations, probably due to settling of larger soil particles in ponds and backwaters in the upper reaches of the river. Annual plutonium transport from the watershed by erosion averages 1.2 mCi, or 0.9 pCi/sq m, which is about 0.05% of the total plutonium in the watershed soil. The primary mechanism for plutonium removal is erosion of small soil particles to which the element is sorbed. (Sims-ISWS)
W78-08549

SEASONAL RUNOFF LOSSES OF NITROGEN AND PHOSPHORUS FROM MISSOURI VALLEY LOESS WATERSHEDS,
Agricultural Research Station, Lafayette, IN.
For primary bibliographic entry see Field 5B.
W78-08550

PREVENTION OF NITRATE LEAKAGE FROM THE HULA BASIN, ISRAEL: A CASE STUDY IN WATERSHED MANAGEMENT,
Technion-Israel Inst. of Tech., Haifa (Israel). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-08564

UTILIZATION OF WOOD RESIDUES FOR HIGHWAY SLOPE STABILIZATION IN NORTH CAROLINA,
North Carolina State Univ., at Raleigh. Highway Research Program.
W. B. Gilbert, and D. J. Osborne.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 956, Price codes: A05 in paper copy, A01 in microfiche. Report FHWA-NC-76-73, January 1976. 76 p, 9 fig, 9 tab, 68 ref. ERSD-110-73-3.

Descriptors: *Erosion control, *Highways, *North Carolina, *Mulching, *Bark, Wood wastes, Hardwood, Vegetation establishment, Fertilizers, On-site investigations, Bank stability, Bank protection, Erosion, Soil stabilization, Vegetation, Planting management, Bark mulch, Hardwood residues.

Use of organic mulch materials at seeding for erosion control on newly created highway slopes is a widely used technique with many materials being utilized. The most widely used mulch material in North Carolina is small grain straw held in place with an asphalt tack. Recent changes in crop rotations and crop varieties have combined to reduce the amount of available straw, prompting a search for other mulch materials. One of these, shredded hardwood bark, was evaluated in field plots for two years in the mountains, Piedmont, and Coastal Plain regions of North Carolina. Three experiments were conducted. The first, a development type study perfected equipment, and techniques and compared rates of application for effectiveness in controlling erosion and producing cover. The second, a seeding technique study using a standard rate of mulch, compared dates of seeding and over-versus underseeding. The third, was a comparison of results of pine bark with cambium mulch at a standard rate, overseeded and underseeded, to results of the second experiment. Additionally, cost and physical data were developed for shredded hardwood bark mulch. The optimum rate used was 35 cubic yards/acre. In each region of the state, bark mulch, whether late or early seeded, over- or underseeded, adequately controlled erosion and produced acceptable cover. Results were comparable to those obtained with straw mulch tacked with asphalt. (Sims-ISWS)
W78-08581

OUR NEWEST NATURAL RESOURCE--COMPACTION--GOOD AND BAD EFFECTS ON ENERGY NEEDS,
Agricultural Research Service, Morris, MN.
For primary bibliographic entry see Field 3F.
W78-08709

STOCHASTIC PREDICTION OF SEDIMENT YIELDS FROM STRIP MINE SPOILS OF THE ARID SOUTHWEST,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 2J.
W78-08729

SOIL EROSION AND SEDIMENT CONTROL ON THE RECLAIMED COAL MINE LANDS OF THE SEMI-ARID SOUTHWEST,
Arizona Univ., Tucson. School of Renewable Resources.
T. R. Verma, J. L. Thames, and J. E. Mills.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 7. Proceedings, Meetings of the American Water Resources Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, April 15-16, 1977, Las Vegas, Nevada, p. 41-47. 1 tab, 3 fig, 10 ref.

Descriptors: *Soil erosion, Degradation, Land reclamation, *Arizona, *Revegetation, Strip mines, Spoil banks, *Watershed management, Monitoring, *Reclamation(Soil), Land development, *Sediment control, Coal mining, *Black Mesa(Ariz).

Extensive land disturbances due to strip mining are expected during the remainder of this century in the semi-arid southwest. Reclamation and revegetation of these areas is a slow process, primarily due to dry and harsh climatic conditions. Erosion and sediment losses are high. Monitoring of the soil erosion process is a crucial step in planning for a long lasting and stable rehabilitation of these disturbed areas. Erosion plots have been laid out to collect data for the universal soil loss equation for estimating soil loss from recontoured coal mine spoils. Effectiveness of different cultural and mechanical treatments for erosion control is also being evaluated. Since large-scale coal mining operations have just begun on the Black Mesa, Preliminary data could be very effective and useful in watershed management planning. (Payton-Arizona)
W78-08730

EFFECTS OF BRUSH TO GRASS CONVERSION ON THE HYDROLOGY AND EROSION OF A SEMIARID SOUTHWESTERN RANGELAND WATERSHED,
Agricultural Research Service, Tucson. AZ. Southwest Watershed Research Center.
J. R. Simanton, H. B. Osborn, and K. G. Renard.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 7. Proceedings, Meetings of the American Water Resources Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, April 15-16, 1977, Las Vegas, Nevada, p. 249-256, 4 fig, 3 tab, 19 ref.

Descriptors: *Rainfall-runoff relationships, Range grasses, Precipitation(Atmospheric), Runoff coefficient, *Vegetation effects, *Range management, Brush, Vegetation, Establishment, Browse utilization, Grasslands, *Carrying capacity, Mathematical studies, Linear regression, Erosion, Sediment yield, Semiarid climates.

Increased nutritional and economic demands for agricultural products have dictated the need for greater and more efficient use of western grass forage. Vegetation manipulation is the quickest and most economical means of increasing forage. However, the hydrologic effects must be taken into consideration before embarking on a large scale vegetation manipulated program. This study discusses the hydrologic and erosion changes measured from a 110-acre semiarid watershed which was converted from brush to grass by root plowing and seeding. Significant changes were observed in rainfall-runoff relationships as average summer runoff was considerably in excess of predictions. Sediment yield also varied, and both of these results were tied to the change in vegetative cover and post conversion rainfall conditions. (Payton-Arizona)
W78-08735

REPLANTING PAKISTAN'S FOREST: TREE BY TREE.
Agency of International Development, Karachi (Pakistan).
Agenda, Vol. 1, No. 5, p 5-11, May, 1978.

Descriptors: *Pakistan, Administrative agencies, Governmental interrelations, *Reforestation, *Watershed management, *Erosion control, Forest management, Runoff, *Social adjustment, Arid lands, Pine trees, Fruit crops, Project planning, Planting management, *Revegetation.

Development of watershed/reforestation projects in Pakistan's northwest frontier province is described. Reluctant cooperation by local farmers has been due to the widespread fear that these government programs were a prelude to government seizure of private property. Increased cooperation has been obtained by payment of food rations to farmers for trees planted on their own property. Suggested future project goals include expansion of tree-planting programs, construction of check dams and leveling of terraces to control soil erosion. (Jewkes-Arizona)
W78-08737

AN ECONOMIC EVALUATION OF CROPLAND USE AS A CONTROL FOR SEDIMENT NON-POINT POLLUTION,
Iowa Agriculture and Home Economics Experiment Station, Ames.
For primary bibliographic entry see Field 5G.
W78-08758

PROCEEDINGS OF THE NATIONAL SYMPOSIUM ON SOIL EROSION AND SEDIMENTATION BY WATER.
American Society of Agricultural Engineers, St. Joseph, MI.
Symposium held in Chicago, Illinois, December 12-13, 1977. 151 p, 25 fig, 17 tab, 275 ref.

Descriptors: *Soil erosion, Erosion, *Sedimentation, *Erosion control, Erosion rates, *Sediment control, Sediment discharge, Sediment load, *Sediment transport, Sedimentation, Sediments, Water pollution control, Water quality, Management, Technology.

This symposium presents, for the practitioner, the results of numerous research projects and investigations which focus upon defining appropriate technologies for alleviating soil erosion and sedimentation by water. Although agricultural erosion and sedimentation problems have received wide-spread attention for decades, the problem still persists. Massive changes in farm machinery, animal husbandry, and cropping have negated many methods of erosion control. New vegetative and mechanical methods for erosion control have been developed to solve problems in 1977. In recent years, besides experiencing an increased demand for clean water, there has been an increased demand for new construction and for minerals and new sources of fossil fuels. Technology has been developed to control erosion and sedimentation from surface mines and construction sites. (See W78-08788 thru W78-0880) (Skogerboe-Colorado State)
W78-08787

SOIL EROSION AND SEDIMENTATION BY WATER--AN OVERVIEW,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Engineering.
G. R. Foster, and L. D. Meyer.
In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12-13, 1977. p 1-13, 53 ref.

Descriptors: *Soil erosion, *Erosion control, Sediments, Rainfall, Water quality, Sediment load, Sediment transport, *Sediment control, *Sedimentation.

Soil erosion and sedimentation by water primarily involve the processes of detachment, transportation, and deposition of sediment by raindrop impact and flowing water. Erosion and sedimentation are major problems that reduce the productivity of cropland, degrade water quality, carry polluting chemicals, and reduce the capacity of water conveyance structures. The erosion-sedimentation system is composed of upland and channel components. While the uplands act somewhat independently of the channels, the behavior of the chanels is directly influenced by the upland inputs. Spatial and temporal variations in erosion are common with time lags in sediment yield as great as several decades. Climate, soil, topography, and land use are major factors influencing erosion and sedimentation. (See also W78-08787) (Skogerboe-Colorado State)
W78-08788

CURRENT SOIL EROSION AND SEDIMENT CONTROL TECHNOLOGY FOR RURAL AND URBAN LANDS,
Soil Conservation Service, Washington, DC.
R. E. Highfill, and L. W. Kimberlin.
In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12013, 1977. p 14-22, 28 ref.

Descriptors: Erosion, *Sediments, Water quality, Water resources, Agriculture, *Erosion control, Sediment load.

Erosion and sedimentation are important factors in managing land and water resources. Agricultural land, especially cropland, produces the largest amount of sediment annually. The next largest source of geologic erosion. Range and forest lands and construction activities are about equal in the amount of sediment produced. Erosion control is important to maintan productivity on agricultural and forest lands and to aid in sediment pollution control. Procedures have been developed for predicting erosion and sediment yield. Technology is available to reduce the amount of erosion and sediment induced by water from most land areas. In some places, additional research or data are needed to improve the peformance of erosion control systems or reduce the cost, or both. The quality of installation and maintenance of erosion control measures is still one of the major problem areas. (See also W78-08787) (Skogerboe-Colorado State)
W78-08789

POLITICAL, SOCIAL, AND ECONOMIC ASPECTS OF SOIL EROSION AND SEDIMENTATION CONTROL PROGRAMS,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 6E.
W78-08790

PREDICTING SOIL EROSION,
Soil Conservation Service, Washington, DC.
L. W. Kimberlin, and W. C. Moldenhauer.
In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12-13, 1977. p 31-42, 26 ref.

Descriptors: *Soil erosion, Erosion, *Erosion rates, *Sediment transport, Sedimentation, Sediments, *Forecasting.

Erosion of soil by water poses an increasing threat as needs for food and fiber production and space for social and economic necessities of a growing population add pressures to land resources. The Universal Soil Loss Equation (USLE) developed

through many years of cooperative efforts of the Agricultural Research Service, state experiment stations, and the Soil Conservation Service is a highly useful tool for predicting sheet and rill erosion under various conditions of land use and management. It is widely accepted and used by soil conservationists and others. However, there are some problems associated with its use and some additional needs to supplement its use in the field. (See also W78-08787) (Skogerboe-Colorado State)
W78-08791

PREDICTING SEDIMENT YIELDS,
Agricultural Research Service Morris, MN. North Central Soil Conservation Research Center.
C. A. Onstad, C. K. Mutchler, and A. J. Bowie.
In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12-13, 1977. p 43-58, 50 ref.

Descriptors: *Soil erosion, Erosion, Sediments, Sediment transport, Sediment load, Sediment discharge, Model studies, *Forecasting, *Sediment yield.

Sediment yield is the amount of soil transported from a drainage basin. Studies for predictions of sediment yield have general uses, which include the following. Simulations are used to extend a short-term sampling program to an adequate data base to predict future watershed response to various land-use alternatives and as an ordered sequence of steps in time and space so that information gaps can be identified. The specific needs for sediment yield prediction are so varied that no single model could meet them without a great loss of efficiency. These needs generally fall into the categories of length of model event time, area to be simulated, and sediment sources. At present, many sediment yield models are available for use or have been used for various purposes. (See also W78-08787) (Skogerboe-COlorado State)
W78-08792

ESTABLISHING SOIL LOSS AND SEDIMENT YIELD LIMITS FOR AGRICULTURAL LAND,
Ohio State Univ., Columbus. Dept. of Agronomy.
T. J. Logan.
In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12-13, 1977. p 59-68, 1 fig, 3 tab, 31 ref.

Descriptors: *Agriculture, *Soil erosion, Erosion, Sedimentation, Sediment discharge, Sediments, Sediment load, *Sediment yield, *Soil loss.

Soil loss tolerance values, T-values, are currently based on annual gross erosion rates that can be tolerated and still maintain crop productivity. The major criterion used by Soil Conservation Service inestablishing these values which range from 1 to 5 tons acre (-1) year (-1) is topsoil depth. The assumptions on which this criterion is based are reviewed. Soil loss in relation to sediment and nutrient watershed yields is discussed and criteria which might be used to establish tolerance values for sediment and nutrient loss abatement programs are given. Soil loss Tolerances for sediment and nutrient loss reduction will likely be more restrictive than T-values and should be applied only to critical areas where the impact of these sources is greatest. (See also W78-08787) (Skogerboe-Colorado State)
W78-08793

SEDIMENTATION AND EROSION CONTROL IMPLICATIONS FOR WATER QUALITY MANAGEMENT,
Environmental Research Lab., Athens, GA. Technology Development and Applications Branch.
L. A. Mulkey, and J. W. Falco.
In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12-13, 1977. p 69-90, 11 fig, 4 tab, 34 ref.

Descriptors: *Soil erosion, *Erosion control, *Water quality control, Sediment transport, Simulation analysis.

Erosion and sedimentation, including sediment transport through a watershed system, play important but complex roles in water quality management. The most meaningful way to evaluate the relative effectiveness of various erosion control methods for water quality management is via continuous simulation models. If water quality goal attainment is attempted by application of source controls within some specified technology limits (including costs), however, a more simplistic approach may be used for analysis of this nonpoint source of environmental pollution. This paper focuses on the latter technique, but also presents the results of more sophisticated analysis methods for illustrative purposes. (See also W78-08787) (Skogerboe-Colorado State)
W78-08794

VEGETATIVE WATER EROSION CONTROL FOR AGRICULTURAL AREAS,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
J. V. Mannering, and C. R. Fenster.
In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12-13, 1977. p 91-106, 3 fig, 11 tab, 27 ref.

Descriptors: *Soil erosion, *Erosion control, Sediment transport, Vegetation, *Vegetation effects.

Methods whereby vegetation can effectively control water erosion are presented. Both crop residues and their management as well as growing vegetation are considered. Crop residue factors that determine their erosion control effectiveness includes (a) the type of crop, (b) the amount and type of residues produced, (c) whether or not residues are removed or left on the field and (d) the effect of residue placement by tillage systems. (See also W78-08787) (Skogerboe-Colorado State)
W78-08795

MECHANICAL EROSION CONTROL FOR AGRICULTURAL AREAS,
Soil Conservation Service, Lincoln, IL.
J. L. Jeschke, R. C. Moe, and W. J. Carmack.
In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12-13, 1977. p 107-115, 2 fig, 4 tab, 5 ref.

Descriptors: Soil erosion, Erosion, *Erosion control(Mechanical), *Agriculture, Terracing.

Mechanical erosion control is discussed as it relates to practice application on sloping cropland. Planning and design considerations for appliying terraces, grade stabilization structures, and debris basins are presented. Special emphasis is placed on the problems involved in designing these practices to be compatible with current farming techniques. The benefits of using topographic maps produced by aerial surveys in planning and design of these practices are also discussed. (See also W78-08787) (Skogerboe-Colorado State)
W78-08796

PROBLEMS OF IMPLEMENTING EROSION CONTROL,
Iowa Soil Conservation Committee, Waterville.
W. R. Hagen.
In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12-13, 1977. p 116-124, 2 tab.

Descriptors: *Soil erosion, Erosion, *Erosion control, Sediment transport, *Soil conservation, Water conservation.

Personal involvement in soil and water conservation work on a farm, during the formation years of the soil conservation movement in the United States to the present is described. Experiences in problems of implementing erosion control are shown, as well as progress in spite of those problems. Current problems in erosion control include (1) only partial community acceptance (2) peer group pressure (3) unsuitable equipment (4) resistance to change (5) economic burdens and (6) damaging press coverage. To counteract these obstacles, the following recommendations are made: (1) continued use of accurate news releases (2) continued education on natural resource problems (3) election and appointment of public officials with a knowledge of and concern for natural resources (4) passage of land use legislation (5) imposing fines on blatant abusers of the land (6) giving tax incentives to landowners who practice c servation and (7) increasing government cost-sharing for establishment of permanent soil conservation practices. (See also W78-08787) (Skogerboe-Colorado State)
W78-08797

EROSION AND SEDIMENT CONTROL IN URBANIZING AREAS,
Soil Conservation Service, College Park, MD.
S. M. Boysen.
In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12-13, 1977, p 125-136, 7 fig, 8 ref.

Descriptors: *Soil erosion, Erosion, *Erosion control, *Sediment control, Sediments, *Urbanization, Cities, *Maryland.

The urban sediment control program in Maryland according to a recent United States Geological Survey report has caused a 60 to 80 percent reduction in construction site sediment yields between 1966 and 1974. The sediment control program, based on a set of basic principles, was developed and implemented beginning in Montgomery county in 1965. Technical principles for controlling erosion and sediment were also developed. The present state law requires that all development must have a sediment control plan approved by the soil conservation district before any construction begins. (See also W78-08787) (Skogerboe-Colorado State)
W78-08798

EROSION AND SEDIMENT CONTROL FOR COAL SURFACE MINE AREAS,
Washington Irrigation and Development Co., Centralia.
R. E. McCarthy.
In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12-13, 1977. p 137-145, 1 fig, 1 tab.

Descriptors: Mining, *Water quality, *Mine drainage, Erosion, Soil erosion, *Erosion control, Sediments, *Sediment control.

The elimination of the impact of a major coal surface mine on the water quality of adjacent waterways through the use of drainage systems, settling ponds, and a monitoring system for dispensing polymer electrolytes for chemical flocculation of suspended sediment is described. (See also W78-08787) (Skogerboe-Colorado State)
W78-08799

EROSION AND SEDIMENTATION ON IRRIGATED LANDS,
Agricultural Research Service, Kimberly, ID. Snake River Conservation Research Center.
J. A. Bondurant.

In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12-13, 1977. p 146-151, 13 ref.

Descriptors: Erosion, *Soil erosion, *Irrigation, Surface irrigation, Sediments, *Sediment discharge, *Irrigated land.

Most erosion on irrigated land is caused by the irrigation itself. Surface irrigation--where water is applied directly to the surface as in furrow or border irrigation--can be very erosive. Data from southern Idaho show that large quantities of sediment may be generated within an irrigation system; however, less sediment may be returned to the river than is diverted with the water supply. Technology for reducing erosion from irrigated fields is available: irrigation systems may be modified or changed, fields may be leveled or profiled to nonerosive slopes, tillage operations can be reduced, vegetative filter strips and drain ditch elevation control will remove sediment, or sediment ponds may be used after runoff leaves the field. (See also W78-08787) (Skogerboe-Colorado State)
W78-08800

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

ELECTRICAL DETECTION PROBLEMS IN WATER ANALYSIS BY SPARK SOURCE MASS SPECTROMETRY,
Virginia Univ., Charlottesville. Dept. of Chemistry.
W. W. Harrison.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 822, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-600/4-77-042, October, 1977. 42 p, 8 fig, 4 tab, 43 ref. R801829-03-0.

Descriptors: *Mass spectrometry, *Trace elements, *Inorganic compounds, *Instrumentation, Equipment, *Design, *Analytical techniques, *Water analysis, *Chemical analysis, *Pollutant identification, Spark source mass spectrometry, Control equipment, Equipment modification, Trace analysis.

Research on the development of control features to make spark source mass spectrometry (SSMS) more quantitative and easier to use is reported; the application of SSMS to water-related problems is detailed. If close attention is paid to experimental variables, SSMS can serve as a complementary technique to other analytical methods for obtaining qualitative and quantitative information concerning trace elements in water and related samples such as sediments and tissues. The development of instrumental additions to improve the operation and control of SMS procedures is described; control features added to the spectrometer allow analyses to be performed more conveniently and precisely. Because of its complexity and cost, widespread use of SSMS is precluded; it is recommended for use in large regional, state, or federal laboratories for materials that require complete elemental screening. Analytical data and procedures and equipment design are detailed; the application of SSMS to specific sample types is demonstrated. (Seip-IPA)
W78-08222

A NEW APPROACH TO 'HIGH SOLIDS' SAMPLE INTRODUCTION FOR FLAME ATOMIC ABSORPTION ANALYSIS,
Arizona Univ., Tucson. Dept. of Chemistry.
R. C. Fry, and M. B. Denton.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A047 550, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No. 11, September, 1977, 19 p, 1 fig, 3 tab, 14 ref. NR 051-549, N00014-75-C-0513.

Descriptors: *Spectrometers, *Water analysis, *Analytical techniques, *Slurries, Aerosols, Design, *Pollutant identification, *Equipment, Instrumentation, Trace elements, Flame atomic absorption spectrometry, High solids nebulizer, Babington nebulization technique, Capillary pneumatic nebulizer, *Trace metals, Spectrochemical analysis.

Described is the direct, clog-free production of high density finely dispersed aerosols from highly complex samples through use of a special nebulizer design based on principles first developed by R. S. Babington. Application of this technique to sample introduction for atomic absorption spectrometry is described for matrices of combined high suspended solids content, increased viscosity, and elevated salt concentration. Copper and zinc are determined in whole blood, urine, sea water, evaporated milk concentrate, and tomato sauce with minimal sample preparation. (Seip-IPA)
W78-08223

DEVELOPMENT OF A SYSTEM FOR CONDUCTING INTERLABORATORY TESTS FOR WATER QUALITY AND EFFLUENT MEASUREMENTS,
FMC Corp., San Jose, CA. Advanced Products Div.
A. C. Green, and R. Naegele.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 274, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-600/4-77-031, June, 1977. 131 p, 16 fig, 18 tab, 109 ref, append. 68-03-2115.

Descriptors: *Testing, *Laboratory tests, *Testing procedures, *Quality control, *Water pollution, *Water quality, Water analysis, Effluents, Analytical techniques, Statistical models, Publications, *Pollutant identification, Interlaboratory testing program.

A dynamic system is developed for evaluating water pollution data and the laboratories which produce these data. The system consists of a plan for the design and implementation of an interlaboratory test program. A pilot test program is included to evaluate and to verify the complete program. Investigation of interlaboratory tests conducted in the past has identified deficiencies in their design and in the procedures by which they were conducted. The conclusions and recommendations are supported by an extensive literature review of previous interlaboratory tests and their methods for experimental design and for test data analysis. Eighteen EPA, State, and private laboratory agencies were visted. The comments, critiques, and suggestions of these agencies (obtained by questionnaire and by personal interview) have served to identify major difficulties and deficiencies in interlaboratory test programs generally; some specific causes of their failure to yield conclusive analytical and proficiency data are cited, and field investigations are described. The interlaboratory test program developed is presented; the functions and responsibilities of each agency are defined. Analytical methods and statistical procedures are specified for sample preparation, for data analysis, and for proficiency evaluation. (Seip-IPA)
W78-08227

MONITORING OF TRACE CONSTITUENTS DURING PCB RECOVERY DREDGING OPERATIONS: DUWAMISH WATERWAY,
Environmental Protection Agency, Seattle, WA. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5B.
W78-08230

AN ANALYSIS OF EXPOSURE PANEL DATA COLLECTED AT MILLSTONE POINT, CONNECTICUT,
Massachusetts Inst. of Tech. Cambridge. Energy Lab.
For primary bibliographic entry see Field 5C.
W78-08231

APPLICATION OF REMOTE SENSING TO THE CHESAPEAKE BAY REGION: VOLUME 1 - EXECUTIVE SUMMARY.
National Aeronautics and Space Administration, Greenbelt, MD. Goodard Space Flight Center.
Available from the National Technical Information Service, Springfield, VA 22161 as NASA CP-6, Price codes: A17 in paper copy, A01 in microfiche. Report No. NASA CP-6 Summary of Conference held Apirl 12-15, 1977, Berkeley Springs, WV, Coolfont Conference Center, April, 1978, 43 p.

Descriptors: *Chesapeake Bay, *Remote sensing, *Conferences, *Water quality, *Environmental control, Standards, Surveys, Equipment, Economics, Programs, Planning, Pollutant identification, *Environmental quality, Policies.

Recommendations that resulted from the Conference on the Application of Remote Sensing of the Chesapeake Bay Region and brief summaries of papers and reports of the working groups are presented. The Conference assembled representatives of Federal and State government agencies engaged in research on the condition and evolution of the Chesapeake Bay to compose a status report, to present current activities and future plans, and to recommend a long-range future course of policies and programs. Findings of the Conference were developed and presented by the attendees divided into six working groups, each of which filed a report containing conclusions and recommendations. Conference presentations, discussions, and reports document the availability of suitable remote sensing monitoring techniques for diagnosing, prescribing, and forecasting the conditios of the Chesapeake Bay. Conference recommendations are summarized under the following headings: (1) Intergroup cooperation/organization/coordination, (2) Environmental quality, (3) Geophysical and environmental surveys, (4) Standards, (5) Advanced sensor development, and (6) Funding. Complete papers, detailed discussions of some of the sessions, and the complete reports of the working groups are found in the Conference Proceedings, Volume 2. (Seip-IPA)
W78-08232

EFFLUENT MONITORING PROCEDURES: BASIC LABORATORY SKILLS - STUDENT REFERENCE MANUAL,
Charles County Community Coll., La Plata, MD.
W. T. Engel, J. H. Highby, and D. M. Wagner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 321, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-430/1-77-011, November, 1977. 123 p, 3 fig, 5 tab, 19 ref. 900501.

Descriptors: *Education, *Training, *Analytical techniques, *Pollutant identification, Effluents, *Monitoring, *Publications, *Laboratory equipment, *Chemical analysis, Measurement, Weight, Aqueous solutions, Volumetric analysis, Bacteria, Effluents, Mathematics, Micorbiology, *Laboratory Skills Manual, Procedures, Specialized training, Training devices, National Pollutant Discharge Elimination System, Chemical compounds.

A basic laboratory skills manual was designed for the treatment plant operator or technician who is required to monitor effluent discharges under a National Pollutant Discharge Elimination System

(NPDES) permit and who had little or no previous experience in laboratory work. The manual contains a review of basic mathematics which includes the metric system, whole numbers, decimals, formulas and percentage. The chemical laboratory section contains applications and procedures such as weighing techniques, use of laboratory equipment, and preparation and standardization of reagents. An introduction to basic microbiological techniques is also included. (Seip-IPA)
W78-08233

A QUANTITATIVE STUDY OF THE DIFFUSE SOURCE LOADINGS OF CHESAPEAKE BAY, (PROGRESS REPORT),
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
For primary bibliographic entry see Field 5B.
W78-08234

SATELLITE REMOTE SENSING STUDY OF THE TRANS-BOUNDARY MOVEMENT OF POLLUTANTS,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 5B.
W78-08239

EFFLUENT MONITORING PROCEDURES: METALS ANALYSIS STAFF GUIDE FOR CONDUCTING THE COURSE,
National Training and Operational Technology Center, Cincinnati, OH.
P. Hallbach.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 393, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-430/1-77/006, December, 1977. 128 p.

Descriptors: *Metals, *Monitoring, *Training, *Testing procedures, *Education, *Analytical techniques, *Water analysis, *Waste water treatment, Effluents, Publications, Testing, Measurement, *Pollutant identification, Effluent monitoring, Effluent analysis, Metals analysis, *Measurement procedures.

A guide is designed to be used by instructors to assist in the conduct of Effluent Monitoring Procedures: Metals Training course. It contains course planning and management information, including course plan and working schedules, training resources, secretarial support, and instructional package worksheets. (Seip-IPA)
W78-08240

THERMAL REMOTE SENSING CALIBRATION TECHNIQUES,
Calspan Corp., Buffalo, NY.
For primary bibliographic entry see Field 7B.
W78-08241

EVALUATION OF THE STANDARD SAMPLING TECHNIQUE FOR SUSPENDED SOLIDS,
Environmental Protection Agency, Kansas City, KS. Surveillance and Analysis Div.
G. D. Reed.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 269, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-907/9-77-001, 1977. 56 p, 19 fig, 9 ref.

Descriptors: *Suspended solids, *Sampling, *Analytical techniques, *Resins, *Tagging, *Copper, *Fluorescent dye, *Pollutant identification, Water analysis, Waste water treatment, On-site investigations, On-site tests, Copper tagging, Fluorescent tagging, Waste water sampling, Waste water analysis, Field sampling.

The inconsistency of non-filterable suspended solids data resulting from automatic sampling equipment used by the Surveillance and Analysis Division of EPA was evaluated from a field sampling technique viewpoint. Resins and other solids of varying specific gravity and particle size were tagged with a metal salt or fluorescent material and added to a waste stream as a synthetic suspended solid to determine the collection efficiency of the samplers. Recovery of the metal salt or fluorescene was used as the indicator of solids recovery. A 832,000 liter/day (220,000 gallon/day) raw domestic wastewater flow was used to conduct the test. Recovery of solids in the hydraulic jump below the Parshall flume, and at the 0.6 depth in the approach channel above the flume was 25% below the theoretical homogeneous concentration indicated by the resin feed rate. The results indicate the need for a method of evaluating the wastewater characteristics for proper sample intake tube placement. (Seip-IPA)
W78-08242

FOLLOW-UP STUDY OF THE DISTRIBUTION AND FATE OF POLYCHLORINATED BIPHENYLS AND BENZENES IN SOIL AND GROUNDWATER SAMPLES AFTER AN ACCIDENTAL SPILL OF TRANSFORMER FLUIDS,
Environmental Protection Agency, Atlanta, GA. Air and Hazardous Materials Div.
For primary bibliographic entry see Field 5B.
W78-08255

MONITORING WATER QUALITY BY REMOTE SENSING,
California State Dept. of Water Resources, Sacramento.
R. L. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 as E77-10194, Price codes: A04 in paper copy, A01 in microfiche. Final Report, NASA CR 154 259, July, 1977. 52 p, 15 fig, 2 tab, 12 ref. NAS 5-20945.

Descriptors: *Remote sensing, Satellites(Artificial), *California, *Water quality, *Monitoring, Aircraft, Mapping, Costs, *Pollutant identification, *LANDSAT, *San Francisco Bay(CA), *San Francisco Delta(CA), *Lake Tahoe(CA), Ground truth.

Results of a study to determine the applicability of remote sensing for evaluating water quality conditions in San Francisco Bay-Delta area and Lake Tahoe, California, are presented. Coincident ground truth was obtained during LANDSAT and U-2 flights and correlated with the remote sensing images to establish a data comparison base line. Images were analyzed for apparent surface anomalies which might indicate water quality problems. It is concluded that: (1) for most water quality monitoring applications, LANDSAT imagery is too infrequent and of too small a scale to be useful in routine monitoring programs; (2) imagery from U-2 and conventional aircraft can be effectively used to monitor gross water quality changes; (3) with the present state-of-the-art in image analysis and the large amount of ground truth needed, remote sensing has only limited application in monitoring water quality; (4) California water quality conditions are improving as a result of the Porter-Cologne Water Quality Act and provisions of P.L. 92-500; an (5) in complex and dynamic systems such as the San Francisco Bay and Delta, large amounts of ground truth data must be collected to support remote imagery; spatial and temporal variations of the parameters are so great that approaches other than synoptic (synchronized multi-point sampling) do not provide enough information to evaluate patterns observed in specific images. (Seip-IPA)
W78-08257

CHARACTERISTICS OF A 'HIGH SOLIDS' NEBULIZER FOR FLAME ATOMIC ABSORPTION SPECTROMETRY,
Arizona Univ., Tucson. Dept. of Chemistry.
R. C. Fry, and M. B. Denton.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A047 551, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No. 12, September, 1977. 33 p, 13 fig, 1 tab, 5 ref. NR 051-549, N00014-75-C-0513.

Descriptors: *Aersols, *Spectrometers, *Instrumentation, *Design, Equipment, *Water analysis, *Pollutant identification, High solids nebulizer, *Flame atomic absorption spectrometry, Aerosol generation, Babington nebulization technique, *Spectrochemical analysis, Trace metals.

Studies are presented to characterize a new nebulizer methodology, which represents a system of similar concentration sensitivity, similar precision, superior operating range, simpler design, and far superior sample handling (high solids) capability as compared to the capillary pneumatic approach. High density, finely dispersed aerosols may be produced from solutions and slurries of elevated salt concentration, high solids content, and increased viscosity. The parameter to be improved on is the required sample size. Although the present one ml transient signal represents a considerable improvement over earlier high solids adaptations of the Babington principle, further improvements are needed to reduce the sample size requirement. At its present state of development, the high solids approach may be optimally used as an auxillary nebulizer for analysis of those materials (greater than or equal to one ml) which are too complex to pass through the capillary orifice of a standard pneumatic nebulizer. (Seip-IPA)
W78-08258

TRACE ANALYSIS OF ARSENIC BY COLORIMETRY, ATOMIC ABSORPTION, AND POLAROGRAPHY,
Tennessee Valley Authority, Chattanooga. Div. of Environmental Planning.
L. H. Howe.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 652, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA - 600/7-77-036, April, 1977. 37 p, 5 fig, 8 tab, 38 ref. E-AP 78BDH.

Descriptors: *Arsenic compounds, *Electric powerplants, Effluents, *Polarographic analysis, *Colorimetry, *Statistical methods, *Trace elements, Separation techniques, Analytical techniques, Spectrometry, Water quality, *Pollutant identification, Differential pulse polarography, *Atomic absorption spectrometry, Coal ash, Steam-electric generating plants. Coal ash ponds, Extraction.

A differential pulse polargraphy method was developed to determine arsenic at concentrations between 2 and 50 micrograms/l in water samples collected from ash ponds at coal-fired steam-electric power plants. Samples were digested in an acidic solution containing a molybdenum (VI) catalyst and the arsenic (V) was reduced to arsenic (III) by cuprous chloride. Arsenic was then isolated by solvent extraction with benzene, back-extracted into water, and quantified in 1 M hydrochloric acid by measuring the differential pulse polarographic current at about -.04 volts. The precision and accuracy of this polarographic method were compared to two standard methods (atomic absorption and colorimetry) for observations on replicate analyses of pure standard solutions, split samples from ash ponds, standard reference samples, and standard solutions spiked with potentially interfering elements. Seven replicate analyses at three concentrations showed that concentrations of arsenic can be determined precisely by either polarography, colorimetry, or

atomic absorption. A two-sample t-test on the means of the polarographic and colorimetric determinations showed (at the 0.05 level of significance) that the colorimetric method gives results negatively biased by 1 microgram/l at concentrations of 20 microgram/l and by 5 microgram/l at concentrations of 40 microgram/l. Paired-sample t-tests showed no significant difference at the 0.05 level among the methods for split samples. (Seip-IPA)
W78-08259

EVALUATION OF THE TECHNICON BLOCK DIGESTOR SYSTEM FOR TOTAL KJELDAHL NITROGEN AND TOTAL PHOSPHORUS,
Environmental Monitoring and Support Lab., Cincinnati, OH. Physical and Chemical Methods Branch.
M. E. Gales, Jr., and R. L. Booth.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 027, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA - 600/4-78-015, February, 1978. 17 p, 2 fig, 9 tab, 5 ref.

Descriptors: Digestors, *Phosphorus, *Nitrogen, Analytical techniques, *Colorimetry, Equipment, *Automation, *Pollutant identification, Surface waters, Potable water, Waste water(Pollution), Industrial water, Industrial wastes, Domestic water, Domestic wastes, Organic compounds, Measurement, Block digestor, *Total Kjeldahl Nitrogen, Organic nitrogen, Organic phosphorus, Industrial waste water, Domestic waste water.

Technicon's Block Digestor method for the simultaneous determination of total phosphorus and total Kjeldahl nitrogen (TKN) has been evaluated and modified for the semi-automated determination of constituents in surface water, drinking water, and domestic and industrial wastes. This system consists of a block digestor that holds 40 digestion tubes and an Auto Analyzer for subsequent colorimetric analysis. Technicon's method can be used to determine organic nitrogen and phosphorus over a range of 0.1 to 20 mg per liter in water and wastewaters at a rate of 20 to 30 samples per hour. The digestion system employed is similar to one used by two other EPA laboratories where less sample is taken; however, the same ratio of sample to digestion solution is maintained. The recovery of 73% nitrogen from nicotinic acid shows that this system has the potential of giving higher results than the conventional manual TKN method. (Seip - IPA)
W78-08260

SITE SELECTION AND DESIGN FOR MINIMIZING POLLUTION FROM UNDERGROUND COAL MINING OPERATIONS,
Alabama Univ., University.
For primary bibliographic entry see Field 5G.
W78-08261

A USER'S GUIDE FOR REDEQL-EPA: A COMPUTER PROGRAM FOR CHEMICAL EQUILIBRIA IN AQUEOUS SYSTEMS,
Corvallis Environmental Research Lab., OR. Marine and Freshwater Ecology Branch.
S. E. Ingle, M. D. Schuldt, and D. W. Schults.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 149, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-600/3-78-024, February, 1978. 88 p, 17 fig, 6 tab, 11 ref.

Descriptors: *Computer programs, Data storage and retrieval, *Metals, *Equilibrium, *Chemical analysis, *Chemical reactions, *Aqueous solutions, Thermodynamic behavior, Hydrogen ion concentration, Oxidation, Chemical precipitation, *Pollutant identification, Ligands, Chemical equilibrium, Aqueous equilibrium, Metal complexes, Oxidation-reduction potential.

A user's guide for the REDEQL-EPA computer program for determining aqueous chemical equilibria among metals and ligands under various conditions of concentration, pH, and oxidation is presented. Aqueous equilibria for up to 20 metals and 30 ligands in a system are computed. The metals and ligands are selected from a list of 35 metals and 59 ligands for which thermodynamic data for complexes and solids have been stored in a data file. More data may be added by the user. The equilibria which the program considers include complexation, precipitation, oxidation-reduction, and pH-dependent phenomena. This guide allows use of the program without reference to the FORTRAN program. The capabilities and limitations of the program are discussed. The formats for input and explanation of output are given with examples illustrating the various program options, and common user errors are discussed. (Seip - IPA)
W78-08262

FIELD AND LABORATORY METHODS APPLICABLE TO OVERBURDENS AND MINESOILS,
West Virginia Univ., Morgantown. Coll. of Agriculture and Forestry.
A. A. Sobek, W. A. Schuller, J. R. Freeman, and R. M. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 495, Price codes: A10 in paper copy, A01 in microfiche. Report No. EPA - 600/2-78-054, March, 1978. 204 p, 4 fig, 14 tab, 168 ref. R803508-01-0.

Descriptors: *Mine drainage, *Coal mines, *Overburden, Soils, *Chemical analysis, *Mineralogy, *Microbiology, *Soil chemical properties, *Soil physical properties, Chemical properties, Physical properties, *Analytical techniques, *Pollutant identification, On-site investigations, On-site tests, Laboratory tests, Water quality, Land use, Planning, Procedural manual, Field sampling, Mineralogic analysis, Microbiological analysis.

Chemical, physical, mineralogical, and microbiological procedures for the analysis of coal overburdens and the resultant minesoils are incorporated in a manual of step-by-step procedures on: (1) field identification of common rocks and minerals: (2) field sampling techniques; (3) processing of rock and soil samples; and (4) chemical, mineralogical, microbiological, and physical analyses of the samples. The methods can be used by mining companies, consultant firms, and State and Federal agencies to ensure mining efficiency, post-mining land and water quality, and long-range land use. Standardized definitions of essential rock, soil, chemical, mineralogical, microbiological, and physical terms are included to facilitate interdisciplinary communiciation. (Seip - IPA)
W78-08264

WATER QUALITY INDICES: A SURVEY OF INDICES USED IN THE UNITED STATES,
Environmental Protection Agency, Washington, DC. Office of Monitoring and Technical Support.
W. R. Ott.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 057, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-600/4-78-005, January, 1978. 128 p, 9 fig, 23 tab, 61 ref, 6 append.

Descriptors: *Water quality, *Indexing, *Information retrieval, *Information exchange, *Federal Water Pollution Control Act, Water quality control, Indicators, *Water quality indices, Public Law 92-500, *Federal Water Pollution Control Act Amendments, Index utilization.

The extent of water quality index use in the U.S. is documented. The indices published in the literature and surveys of the States and interstate commissions are reviewed to determine: (1) which agencies are using indices, (2) the type of index being used, (3) the purpose of its use, and (4) the attitudes of agency personnel toward indices. One-fifth of the State and interstate agencies (12 out of 60) were classified as users of water indices. Of the 51 state agencies (including DC), 10 states (20%) were classified as index users. The National Sanitation Foundation Index was the most commonly used, by 7 of the 12 index users. The remaining agencies use Harkins' index or various user-developed indices. A total of 16 additional State and one interstate commission are planning to evaluate indices for possible future application or are developing or evaluating indices at the present time; these were classified as 'potential users'. Six new indices have been developed by water pollution control agencies; their mathematical structures are documented. The main purposes expressed by index users for applying their indices are preparation of the annual reports required by Section 305(b) of P.L. 92-500, public information, and analysis of water quality trends. Most users feel that EPA should have a suggested index available (or a set of indices) for those agencies that wish to use a uniform index structure. There is clear evidence of a trend toward increased utilization of water quality indices. Several recommendations are included for meeting the needs of index users, attaining greater uniformity in water quality data analysis practices, and identifying future research needs. (Seip-IPA)
W78-08265

SOURCE ASSESSMENT: MAJOR BARIUM CHEMICALS,
Monsanto Research Corp., Dayton, OH.
R. B. Reznik, and H. D. Toy, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 756, Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA-600/2-78-004b, March, 1978. 138 p, 22 fig, 43 tab, 38 ref, 7 append. 68-02-1874.

Descriptors: *Chemical industry, *Air pollution, *Air pollution effects, *Pollution abatement, Environmental effects, *Pollutant identification, Standards, Effluents, Incineration, *Barium, *Barium chemicals industry, Air pollution sources, Air quality standards, Air emissions, *Air pollution abatement particulates, Barium sulfide, Barium carbonate, Barium chloride, Barium hydroxide, Barium sulfate, Sulfur oxide, Hydrogen sulfide, Nitrogen oxides, Calcines, Black ash rotary kilns, Scrubbers, Electrostatic precipitators, Dryers.

A study of air emissions, including particulates, sulfur and nitrogen oxides, carbon monoxide, hydrocarbons, barium compounds, and polynuclear organic materials, from the manufacture of major barium chemicals, is described. Compounds studied include: BaS, BaCO3, BaC12, Ba(OH)2, and BaS04. Major emission points are the black ash rotary kiln where barite ore is reduced to BaS, the hydrogen sulfide incinerator where byproduct H2S is burned, the exhaust from the Ba(OH)2 process, and final product dryers and calciners. To evaluate potential environmental effects, source severity(s) was calculated for each emission from each emission point. The highest values of S occurred for sulfide oxide emissions from the H2S incinerator (1.89), the black ash rotary kiln (1.51), and the Ba(OH)2 process exhaust (1.6), and for emissions of soluble barium compounds from product dryers and calciners (0.79-200). Several control devices reduce emissions. Scrubbers and baghouses are used on the black ash rotary kiln and on product dryers and calciners. A scrubber and an electrostatic precipitator are employed to control the exhaust from the barium hydroxide process. By-product H2S may be absorbed in caustic instead of being incinerated. (Seip-IPA)
W78-08266

IDENTIFICATION OF COMPONENTS OF ENERGY-RELATED WASTES AND EFFLUENTS,
Research Triangle Inst., Research Triangle Park, NC.
E. D. Pellizzari.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 203, Price codes: A22 in paper copy, A01 in microfiche. Report No. EPA-600/7-78-004, January, 1978. 500 p, 69 fig, 164 tab, 44 ref, 4 append. 68-03-2368.

Descriptors: *Organic compounds, *Solid wastes, *Pollutant identification, *Electric powerplants, *Thermal powerplants, *Oil shales, *Coal mines, Gas chromatography, Mass spectrometry, Analytical techniques, Aqueous effluents, Chemical elements, Coal liquefaction, Coal gasification, Coal-fired powerplants, Oil refineries, *Geothermal energy, Spark source mass spectrometry, Atomic absorption spectrophotometry.

A state-of-the-art review on the characterization of organic and elemental substances in energy-related liquid and solid effluents was conducted. Previous and ongoing research programs and reports were reviewed to summarize the existing and probable future data on chemical elements and organic compounds in solid waste and aqueous effluents from: (1) coal liquefaction and gasification plants, (2) coal-fired power plants, (3) oil-shale processors, (4) oil refineries, (5) coal mines and (6) geothermal energy. The reliability of existing information and the probability of accumulation of adequate data from current and past contracts and projects was evaluated according to preselected criteria. Based upon the absence of adequate data on the composition of energy samples, a chemical characterization program was conducted for several energy-related processes. The necessary preconcentrations and purification were performed on these samples and the volatile and semi-volatile and semi-volatile organic compounds were identified and quantified. Samples for organic and mercury analysis were subjected to a single analytical protocol in each case to permit comparison among samples. Organic constituents were analyzed by gas chromatography/mass spectrometry/computer. Elemental components were determined and measured by spark-source mass spectrometry for all the elements in the periodic chart through uranium with the exception of oxygen, helium, hydrogen, neon, krypton, xenon, radon, nitrogen and carbon. The analysis of mercury was performed by flameless atomic absorption spectrophotometry. (Seip-IPA)
W78-08267

MODELING TECHNIQUES FOR ESTIMATING FECAL COLIFORMS IN ESTUARIES,
Oregon State Univ., Corvallis. Dept. of Food Science and Technology.
For primary bibliographic entry see Field 5B.
W78-08278

VIRUS SAMPLING IN WASTEWATER--FIELD EXPERIENCES,
Los Angeles County Sanitation District, Whittier, CA.
M. W. Selna, and R. P. Miele.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 103, No EE4, August 1977, p 693-705. 2 fig, 5 tab, 8 ref.

Descriptors: *Waste water(Pollution), *Sampling, *Viruses, *Recovery time, Adsorption, Efficiencies, Detection probability, Waste water treatment, Water reclamation, *Pollutant identification.

Membrane adsorption, chemical precipitation, and soluble alginate filtration methodologies have been combined in the development of a relatively simple yet sensitive procedure for detecting low concentrations of virus in wastewater. Techniques originally developed for sampling clean water were modified after initial attempts at wastewater sampling were unsuccessful. Each segment of the modified procedure has been repetitively tested in sampling various wastewater effluents seeded with Poliovirus 1. Virus recovery efficiency in each segment of the procedure is reported herein. Detection limits at each stage of sample processing are delineated. The procedure is being utilized in comparison with virus removal by various wastewater treatment systems. A major prerequisite of this study was the ability to detect low concentrations of both seeded and naturally occurring viruses in large volumes (20 gal to 100 gal) of treated wastewater. (Graf-Cornell)
W78-08303

EVALUATION AND IMPROVEMENT OF QUALITY CHARACTERISTICS OF URBAN STORMWATER,
New South Wales Univ., Kensington. (Austrialia). School of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-08310

FORMAT FOR ACQUIRING RAPID DATA ANALYSIS CAPABILITIES OF STORED DATA: MANIPULATION OF NATIONAL EUTROPHICATION SURVEY WATER QUALITY DATA,
Environmental Monitoring and Support Lab., Las Vegas, NV. Monitoring Operations Div.
J. D. Bliss, M. J. Freidland, and J. Hodson.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-262 995, Price codes: A02 in paper copy, A01 in microfiche. EPA-600/4-76-057, Report November 1976. 13 p, 1 fig, 5 ref, 1 append.

Descriptors: *STORET, *Eutrophication, *Data processing, *Data storage and retrieval, *Computer programs, WYLBUR, Environmental Protection Agency, Data collections, National Eutrophication Survey, Computers, Nutrients, Lakes.

The STORET.TO.WYLBUR job control language was developed to convert raw data in EPA's STORET data storage and retrieval system to a standardized format to facilitate statistical evaluation and manipulation of National Eutrophication Survey data. STORET.TO.WYLBUR, effective for acquiring rapid analysis capabilities of STORET data, is usable by relatively inexperienced computer programmers. A user must be familiar with the mechanics of STORET retrieval, particularly PGM=RET, its associated options, and the more common WYLBUR editing commands. WYLBUR is an assigned name for a text 'editor' and remote job entry facility. The National Eutrophication Survey was initiated in 1972, and through it water quality data has been collected from over 800 U.S. lakes. More than two million data points have been generated. The STORET.TO.WYLBUR package was necessitated by the inadequacy of program options internal to STORET; the new package may be suitable for general use as another STORET internal program option. STORET.TO.WYLBUR converts data into EDIT format from the MORE file generated by the STORET raw data retrieval. Examples of the use of the package are given. (Lynch-Wisconsin)
W78-08377

ANALYSIS OF ESTUARINE SOIL GRADIENTS IN SALT MARSHES OF THE SOUTHWESTERN NETHERLANDS WITH SPECIAL REFERENCE TO THE SCHELDT ESTUARY,
Delta Inst. for Hydrobiological Research, Yerseke (Netherlands).
W. G. Beeftink, M. C. Daane, J. M. Van Liere, and J. Nieuwenhuize.
Hydrobiologia, Vol 52, No 1, p 93-106, 1977. 7 fig, 4 tab, 26 ref.

Descriptors: *Estuaries, Water pollution, Organic matter, Phosphates, Nitrogen, Potassium, Clays, Carbonates, Hydrogen Ion concentration, *Salt marsh soils, *Soil gradients, *Scheldt estuary(The Netherlands), The Netherlands, Microgradient, Macrogradient.

Studies on macro and microgradients in salt marsh soils of the Scheldt estuary are compared with data of some marshes in the Rhine-Meuse estuary. Soil parameters investigated are clay, carbonate, organic matter, pH, nitrogen, potassium and phosphate. The macrogradients are related to corresponding estuarine aquatic gradients. The hypothesis that estuarine soil gradients can be reflections of similar aquatic gradients is affirmed for two gradients. Soil gradients of upstream increasing organic matter and phosphate contents have been found, relating significantly to corresponding aquatic gradients caused by river pollution. In the same direction gradients of decreasing nitrogen and potassium contents occur. A macrogradient in carbonate content was not found. Some microgradients in clay and carbonate contents are described, and relevant mutual relationships between the soil parameters are characterized. (Maroncelli-Mass)
W78-08407

HEAVY METALS IN WASTE WATERS FROM THE CITY OF ZURICH (SCHWERMETALLE IN DEN ABWAESSERN DER STADT ZUERICH),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewasserschutz, Zurich (Switzerland).
H. R. Hegi, H. R. Krahenbuhl, C. Liebi, P. V. Roberts, and A. Weber.
Gas-Wasser-Abwasser, Vol. 57, No. 11, p 799-804, 1977. 10 tab, 3 fig, 18 ref.

Descriptors: *Heavy metals, *Sewage effluents, *Influent streams, *Sewage sludge, *Lead, Cadmium, Chromium, Copper, Nickel, Zinc, Waste water treatment, Municipal wastes.

Heavy metal concentrations were monitored in influent and effluent from two waste water treatment facilities in Zurich, Switzerland. The heavy metals measured in daily and weekly influent, effluent, and sludge samples included: lead, cadmium, chromium, copper, nickel, and zinc. Influent concentrations averaged 0.2 mg/liter of chromium, copper, lead, and nickel; 0.5 mg/liter of zinc and 0.01 mg/liter of cadmium. Heavy metal removal by the treatment process averaged from 60-80%. Corresponding heavy metal concentrations were found in the digested sludge from the waste water treatment plants. Mean concentrations measured in the sludge were 3,000 mg/kg dry matter for zinc; 300-800 mg/kg dry matter for chromium, copper, nickel, and lead; and 20 mg/kg for cadmium. (Lisk-FIRL)
W78-08443

PROTON BINDING IN FULVIC ACID EXTRACTED FROM SEWAGE SLUDGE-SOIL MIXTURE,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
G. Sposito, K. M. Holtzclaw, and D. A. Keech.
Soil Science Society of America Journal, Vol. 41, No. 6, p 1119-1125, 1977. 2 fig, 3 tab, 15 ref.

Descriptors: *Humic acids, *Fulvic acids, *Volumetric analysis, *Sewage sludge, *Soil chemical properties, Organic wastes, Soil analysis, Return flow, Potassium compounds, Organic acids, Sludge disposal.

Proton disassociation from sludge-derived fulvic acids was measured with potentiometric titrations conducted at 25C and pH 11 using potassium-fulvate solutions in a potassium ionic medium and hydrochloric acid. Using a model describing the titration curve of fulvic acid, formation functions and conditional protonation constants were calcu-

lated for the classes of acidic functional groups protonating between 3-11. Three functional groups of weak acids were evaluated for logarithmic protonation constants averaging 3.9, 6.5, and 9.4. The quantity of titratable protons within the functional groups decreased with increasing standing time between preparation of the fulvic acid solution and calculation of the titrametric curve. Data on the reversibility of the fulvic acid titrations was also collected. (Lisk-FIRL)
W78-08462

TESTSETS FOR THE QUANTITATIVE ANALYSIS OF AQUEOUS SOLUTIONS WITH PERMANENT INDICATION (TESTSETS FUR DIE QUANTITATIVE ANALYSE WAESSRIGER LOESUNGEN MIT BLEIBENDER ANZEIGE),
J. Gleisberg.
Zeitschrift fuer Wasser- und Abwasserforschung, Vol. 11, No. 1, p 13-27, 1978. 15 fig, 23 tab, 3 ref.

Descriptors: *Colorimetry, *Analytical techniques, *Testing procedures, *Chemical analysis, *Copper, Iron, Nickel, Sulfides, Titanium, Cobalt, Zinc, Sodium chloride, Waste water treatment, Municipal wastes.

The Aquanal test sets can quantify trace concentrations of various elements in aqueous solutions by colorimetric techniques. The single-use test kit, equipped with a sampling mechanism and a filter, mixes the sample solution with reagents to form colored cylindrical layers with lengths from 0.5-25 mm which are proportional to the solution concentration as measured on a gauged scale. Aquanal test sets can be used to detect cyanide, iron (III), cobalt (II), copper (II), nickel (II), sulfide, titanium (IV), vanadium (V), and zinc in concentrations of 0.5-10 mg/liter; test sets are available for detecting concentrations over a range of 5-100 mg/liter of cyanide, iron (II), cobalt (II), copper (II), nickel (II), and zinc. Salts can be measured over 50-3,000 mg/liter and 1,000-40,000 mg/liter as sodium chloride. The Aquanal test sets can provide cumulative concentrations, as well as the individual concentrations of elements in solution. Permissible levels of cations and anions in solution which may interfere with analyses are listed for each element. A series of control sets is available for calibration. The system is capable of documenting concentration changes over a certain time period and accumulating trace metals within a small volume of adsorbent. (Lisk-FIRL)
W78-08467

CRITICAL CONSIDERATIONS ON THE DETERMINATION OF EXTRACTABLE SUBSTANCES IN POLLUTED WATERS (CONSIDERAZIONI CRITICHE SULLA DETERMINAZIONE DI SOSTANZE ESTRAIBILI IN ACQUE INQUINATE),
Florence Univ. (Italy). Inst. of Analytical Chemistry.
P. C. Legittimo, E. B. Piccardi, and F. Pantani.
Rassegna Chimica, Vol. 29, No. 6, p 297-303, November-December, 1977. 4 fig, 7 ref.

Descriptors: *Solvent extractions, *Separation techniques, *Analytical techniques, *Pollutant identification, Organic compounds, Phenols, Surfactants, Spectrophotometry, Water analyses, Water chemistry, Water quality, Organic wastes, Waste water treatment.

Methods to extract, identify, and measure fatty substances in large volumes of waste water are examined in detail. Solvent extraction of fatty substances with chloroform is not satisfactory in the presence of nonionic surfactants because of the nearly complete coextraction. Benzene extracts only 20-25% of these surfactants and partially removes anionic surfactants and phenolics. A carbon adsorption method using chloroform for elution results in the nearly complete separation of nonionic surfactants along with fatty substances; anionic curfactants are eluted from the carbon only partially by chloroform. In the presence of phenolics, the chloroform eluate obtained after carbon adsorption must be analyzed spectrophotometrically; the distilled portion is discarded. (Takacs-FIRL)
W78-08468

THE EFFECT OF QUICK FREEZING ON THE CONTENT OF ORGANIC WATER CAPACITY SUBSTANCES (DIE WIRKUNG DES TIEFGEFRIERENS AUF DEN GEHALT AN ORGANISCHEN WASSERINHALTSTOFFEN),
U. Neis.
Zeitschrift fuer Wasser- und Abwasserforschung, Vol. 11, No. 1, p 3-7, 1978. 6 fig, 3 tab, 10 ref.

Descriptors: *Freezing, *Freeze-thaw tests, *Chemical oxygen demand, *Biochemical oxygen demand, *Carbon, Laboratory tests, Activated sludge, Analytical techniques, Storage, Preservation, Sampling, Waste water treatment, Municipal wastes.

The impact on waste water samples of quick freezing as a storage method was evaluated with respect to values of COD, BOD, and total organic carbon (TOC). Unfiltered samples of waste water from a preclarifier, an activated sludge tank, and a receiving stream were used in the study. One liter samples were quick frozen at -30C and retained for 8 and 16 days. BOD concentrations in the waste water samples which had been frozen for 8 and 16 days were noticeably lower 5 days after thawing than the concentration of an unfrozen sample. Of the samples which were frozen, the activated sludge effluent had the highest BOD concentration while the receiving stream sample exhibited the lowest values. COD concentrations in preclarified effluent decreased from the initial 137 g/cu m to a minimum of 112 g/cu m after 16 days of freezing; activated sludge liquor COD increased from 2,000 g/cu m to a maximum of 2,520 g/cu m after 8 days of freezing; and receiving water COD increased from an initial 17 g/cu m to 23 g/cu m after 16 days. The TOC values of preclarification effluent and the activated sludge liquor were not significantly affected by freezing. (Lisk-FIRL)
W78-08469

PROFILE-ANALYSIS OF POLYCYCLIC AROMATIC HYDROCARBONS IN SEWAGE SLUDGE BY GAS CHROMATOGRAPHY (GASCHROMATOGRAPHISCHE PROFILANALYSE DER POLYCYCLISCHEN AROMATISCHEN KOHLENWASSERSTOFFE IN KLARSCHLAMMPROBEN),
Biochemisches Inst. fuer Unweltearcinogene, Ahrensburg (West Germany).
G. Grimmer, H. Boehnke, and H. Borwitzky.
Fresenius Zeitschrift fuer Analytische Chemie, Vol. 289, No. 2, p 91-95, 1978. 2 fig, 1 tab, 6 ref.

Descriptors: Pollutant identification, *Aromatic compounds, *Gas chromatography, *Analytical techniques, *Organic compounds, *Sewage sludge, Profiles, Aluminum, Filtration, Mass spectrometry, Waste water treatment, Municipal wastes.

A profile analysis of polycyclic aromatic hydrocarbons in sewage sludge was performed with gas chromatography. A 25 ml source of cyclohexane was mixed with 45 ml of dimethylformamide and 5 ml of water; chromatography was performed with 10 mg of Sephadex LH20 in 50 ml of isopropanol; the cyclohexane was filtered on aluminum oxide. The polycyclic aromatic hydrocarbons were separated by gas chromatography with high performance columns and the signals were compared with internal standards. Five analyses of the sample for 18 main components yielded a variation coefficient of 1.6-11.3%. The retention time of the polycyclic aromatic hydrocarbons controlled the detection limit under amplification. The polycyclic aromatic hydrocarbons were detected in the range of 0.5-5.0 ng while benzo(a)pyrene was in the 1 ng range. Mass spectrometry in conjunction with the gas chromatography was considered unnecesary as the profiles of different sludges were similar. (Lisk-FIRL)
W78-08470

PERSISTENCE OF ENTEROVIRUSES IN SEWAGE SLUDGE,
Ontario Ministry of Health, Toronto. Lab. Services Branch.
T. P. Subrahmanyan.
Bulletin of the World Health Organization, Vol. 55, No. 4, p 431-434, 1977. 1 fig, 2 tab, 14 ref.

Descriptors: Pollutant identification, *Viruses, *Sludge digestion, *Sewage sludge, *Diseases, *Temperature, Analytical techniques, Volumetric analysis, Irrigation techniques, Sludge disposal, Waste water treatment, Municipal wastes.

The survival of viruses in sewage sludge was investigated under varying conditions of pH, temperature, and time in laboratory experiments. Titers of viruses in sewage sludge maintained at pH 6.0, 6.5, 7.5, 8.5, and 9.5 indicated that maximum enterovirus elution occurred at pH 9.5. Chloroform did not affect the infectivity of attenuated poliovirus type 1, coxsackievirus B5, and echovirus type 6. Viral concentrations in sewage sludge maintained at room temperature (22C) and at 4C were unchanged after 7 days and were smaller in amount after 14 days. Larger quantities of poliovirus survived at 4C than at 22C after 14 days. The survival of various enteroviruses in digested sludge at 22C was observed over a period of 12 weeks. Coxsackievirus A9 survived less than 2 weeks; coxsackievirus B2 and B4 survived less than 5 weeks; and coxsackievirus B5 survived the entire 12 weeks of the experiment. Echovirus type 6 was evident through the 10th week and type 9 survived through the 12 weeks. Virulent polio type 3 and vaccine polio type 1 persisted until the 8th week; polio vaccine type 3 and virulent polio type 1 were present in the 10th week. Echovirus type 6 survived 10 weeks while the echovirus type 9 was detected through the entire 12 weeks. The viruses survived longer in sludge than in another medium. Separate tests with reovirus type 2 demonstrated a survival period of 6 weeks. (Lisk-FIRL)
W78-08472

RELATION BETWEEN DEHYDRABILITY AND PROPERTIES OF SEWAGE SLUDGE (REPORT I) (GESUIODEI NO SHOSEIJO TO DASSEUISEI NI TSUITE),
M. Yokoyama, F. Nozawa, S. Toda, and Y. Kondo.
Ebara Infiruko Jiho, EBARA-INFILCO Engineering Review, No. 72, p 2-11, 1978. 3 fig, 9 tab.

Descriptors: *Dewatering, *Sludge treatment, *Capillary action, *Chemical analysis, *Analytical techniques, Capillary conductivity, Chemical precipitation, Lime, Polyelectrolytes, Physical properties, Waste water treatment, Municipal wastes.

Chemical and physical techniques were employed to measure the properties of digested and undigested sewage sludge. The dewaterability of sewage sludge was considered to be best described by the capillary suction time. Differences in concentrability and particle size were less apparent in tests with different sludges than in capillary suction time measurements. The capillary suction time index was used to determine the optimum rate of ferric chloride and slaked lime feed to sewage sludge during dewatering. Polyelectrolyte conditioning, which impeded the removal of the sludge cake and increased the water content of certain sludges, was not considered generally applicable. (Lisk-FIRL)
W78-08473

MICROSCOPIC OBSERVATION OF ACTIVATED SLUDGE APPLIED TO THE MONITORING OF TREATMENT PLANTS (L'OBSERVATION MICROSCOPIQUES DES BOUES ACTIVEES APPLIQUE A LA SURVEILLANCE DES INSTALLATIONS D'EPURATION: TECHNIQUE D'ETUDE INTERPRETATION),
Montpellier-2 Univ. (France). Lab. de Genie Chimique, Traitement et Epuration des Eaux.
C. Drakides.
Techniques et Sciences Municipales-l'Eau, Vol 73, No 2, p 85-98, February, 1978. 18 fig, 16 ref.

Descriptors: *Activated sludge, *Analytical techniques, *Bioassay, *Sludge treatment, *Monitoring, Operation and maintenance, Microorganisms, Biodegradation, Flocculation, Bacteria, Organopleptic properties, Sewage treatment, Municipal wastes, Waste water treatment.

Observations of macroscopic and microscopic activated sludge characteristics are forwarded as a means of monitoring the operation of biological waste water treatment plants. Clear or slightly turbid supernatant (transparency of 40-80 cm or more) is considered indicative of efficient operation and low BOD and COD levels in the effluent. A high degree of purification is also represented by: the presence of a light, white flexible froth; the characteristic odor of moist earth; particles measuring 20-50 microns; non-filamentous free bacteria counts in the range of 10 to the 10th to 10 to the 11th/liter; and a diverse microfaunal assemblage in normal abundances.
W78-08475

TEEPOL AND TRITON MEDIA FOR THE ENUMERATION OF ESCHERICHIA COLI BY MEMBRANE FILTRATION,
Dundee Univ. (Scotland). Dept. of Civil Engineering.
A. A. Opara, D. D. Mara, and D. W. F. Wheater.
Water Research, Vol 11, No 11, p 949-954, 1977. 11 tab, 20 ref.

Descriptors: *E. coli, *Cultures, *Membrane processes, *Filtration, *Sewage bacteria, Analytical techniques, Membranes, Filters, Fermentation, Bacteria, Separation techniques, Waste water treatment, Municipal wastes.

More accurate techniques of E. coli enumeration in waste, river, and estuarine waters were investigated by varying the concentration of Teepol broth and modifying Triton agar broth for use with membrane filtration. False E. coli counts inaccurate by up to 25% have resulted from utilizing membrane-enriched Teepol broth at 44C. In this study, the concentration of basal Oxoid membrane-enriched Teepol broth was varied from 0-7%. A Triton agar broth containing 2 ml of the nonionic surfactant Triton X-100 was membrane-enriched for use in filtration. Control groups cultured in tryptone mannitol broth and for use in filtration. Control groups cultured in tryptone mannitol broth and tryptone lactose formate broth were retested using lactose peptone water and tryptone water when negative results occurred. Millipore membranes were used for filtration. False positive enumerations of E. coli were reduced from 0.4 to 0.2%. Enumeration errors were reduced to 6.8% when E. coli in 0.2% Triton in a membrane-enriched agar medium were filtered through membranes at 44C. (Lisk-FIRL)
W78-08476

COMPARISON OF ADSORPTION ELUTION METHODS FOR CONCENTRATION AND DETECTION OF VIRUSES IN WATER,
Hadassah Medical School, Jerusalem (Israel). Environmental Health Lab.
B. Fattal, E. Katzenelson, T. Hostovsky, and H. In Shuval.
Water Research, Vol 11, No 11, p 955-958, 1976. 4 tab, 20 ref.

Descriptors: *Viruses, *Membrane processes, *Polyelectrolytes, *Chemical precipitation, *Aluminum, Filtration, Separation techniques, Pollutant identification, Diseases, Membranes, Waste water treatment, Municipal wastes.

Removal of poliovirus and enteroviruses from sewage was tested with aluminum hydroxide precipitation, cellulose nitrate membrane filtration and glycine buffer elution, insoluble polyelectrolyte treatment, and cellulose nitrate filtration with beef extract elution. The control aluminum hydroxide precipitation techniques recovered an average of 50% of the poliovirus. The cellulose nitrate membrane filter with glycerine buffer elution recovered an average of 65%. Seventy-seven per cent of the poliovirus was removed on the cellulose nitrate membrane filter with a 3% beef extract solution. The insoluble polyelectrolyte (PE 60) removed an average of 70% of the poliovirus. Enterovirus recovery from sewage averaged 40% with aluminum hydroxide precipitation, 111% with membrane filtration and beef extract elution, 67% on the membrane filter with glycerine buffer, and 80% with PE 60. In experiments with echovirus 7, poliovirus, and enterovirus seeded in tap water, recovery rates were higher than those from sewage. (Lisk-FIRL)
W78-08477

DETERMINATION OF TOCL BY ENRICHMENT ON POWDERED ACTIVATED CARBON AND FLOCCULATION (UNTERSCHUNGEN ZUR BESTIMMUNG DE ORGANISCH GEBUNDENEN CHLORS MIT HILFE EINES NEUARTIGEN ANREICHERUNGSVERFAHREN),
W. Kuhn, F. Fuchs, and H. Sontheimer.
Zeitschrift fuer Wasser- und Abwasserforschung, Vol 10, No 6, p 192-194, 1977. 2 fig, 3 tab, 3 ref.

Descriptors: *Chlorine, *Activated carbon, *Analytical techniques, *Flocculation, Alumimum, *Adsorption, Polymers, Organic wastes, Pollutant identification, Chlorination, Testing procedures, Measurement, Water analysis, Municipal wastes.

Enrichment of chlorine compounds on powdered activated carbon followed by flocculation was performed as a preliminary to pyrohydrolysis detection of total organic chlorine. Conventional concentration techniques for chlorine compounds utilized granular activated carbon is a miniature sampler unit. The described enrichment procedure employs powdered activated carbon for step-by-step adsorption of chlorine compounds at pH 5. Enrichment is followed by flocculation with 100 mg aluminum and 8 mg polymer at pH 6.5 for 10 min. The dectection range of this analytical technique is reported to be about 20 micrograms of total organic chlorine/liter. (Lisk-FIRL)
W78-08478

CONTROL TESTS AND KINETICS OF ACTIVATED SLUDGE PROCESS,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical and Environmental Engineering.
For primary bibliographic entry see Field 5D.
W78-08482

RESULTS OF POLLUTION CONTROL OF THE RHINE WATER IN RHINELAND-PALATINATE (ERFOLGE BEI DER REINHALTUNG DES RHEINS IN RHEINLAND-PFLAZ),
Landesamt fuer Gewasserkunde, Mainz (West Germany).
For primary bibliographic entry see Field 5G.
W78-08496

A SHORT TERM STUDY ON THE POLLUTION OF TAPTI RIVER IN SURAT REGION,
S. V. Regional Coll. of Engineering and Technology, Surat (India).
R. N. Shelat, N. V. Vashi, and N. V. Subbayya.
Journal of the Institution of Engineers (India), Vol. 58, Part EN1, p 25-28, October, 1977. 5 fig, 1 tab, 4 ref.

Descriptors: *Water pollution sources, *Rivers, *Outlets, *Sampling, *Pollutant identification, Biochemical oxygen demand, *Chemical oxygen demand, Industrial wastes, Suspended solids, Sulfates, Chlorides, Sewage, Sewers, Domestic wastes, Municipal wastes, *India, Tapti River(Surat region).

Physical and chemical water quality parameters were recorded at 10 sampling stations along a 16-km portion of the Tapti River in the Surat region of India. Pollution sources along the river included a paper mill, a thermal power plant, municipal sewage, domestic sewage, and textile wastes. The pH of the river samples ranged from 6-8 with a temperature of 20-24 C. Other chemical parameter ranges included: 24-54 mg/liter chlorides, 17-52 mg/liter sulfates, 6.2-8.4 mg/liter dissolved oxygen, 40-280 mg/liter BOD, and 89-512 mg/liter COD. Total solids ranged from 48-344 mg/liter with suspended solid loads of 42-269 mg/liter. While the physical properties of the river water did not exceed Indian water quality standards, BOD values were higher than allowed at all sampling sites; chlorides exceeded standards near the municipal storm water outlet to the river. The pollutant levels were lower during the winter months. (Lisk-FIRL)
W78-08504

STUDIES ON THE TREATMENT OF NIGHT SOIL. VII. IDENTIFICATION OF BACTERIA ISOLATED FROM AEROBIC TREATMENT PLANT OF UNDILUTED NIGHT SOIL AND AMINO ACID UTILIZATION BY THESE BACTERIA (SHINYOSHORI NI KANSURU KENKYU (DAINANAHO)--MUKISHAKU SHINYO NO KOKUSEI SHORISHISETSU KARANO JOKASAIKIN NO BURNI RO SONO AMINO SAN BURKAINO),
Gifu Coll. of Pharmacy, (Japan). Dept. of Environmental Hygiene.
T. Ishikawa, J. Fukuyama, Y. Ose, and T. Sato.
Gifu Yakkadaigaku Kiyo, (Annual Proceedings of Gifu College of Pharmacy), Vol. 26, p 8-12, 1978. 1 fig, 2 tab, 12 ref.

Descriptors: *Bacteria, *Domestic wastes, *Amino acids, *E. coli, *Aerobic treatment, Sewage bacteria, Organic acids, Oxidation, Organic compounds, Waste water treatment, Analytical techniques, *Municipal wastes.

Amino acid utilization by bacteria isolated from undiluted domestic wastes was identified in aerobically-treated waste water. The domestic wastes were aerated in a series of four digestion tanks following grinding. The wastes were settled; excess sludge was removed; and the waste was diluted. Secondary aeration of the effluent was followed by final clarification and chlorination. Excess sludge from the sedimentation tank, secondary aeration tank, and clarifier was dewatered by centrifugation. Analyses of the treated effluent revealed the presence of Bacillus megaterium, Escherichia coli variety communior, and Staphylococcus epidermis. Oxidation of the amino acid, L-alanine, amounted to 75.2% by B. megaterium and 64.7% by E. coli variety communior. Other forms of amino acid utilization included: L-valine and L-leucine by B. megaterium; L-lysine HCL by E. coli; and L-aspartic acid and L-glutamic acid by E. coli and B. megaterium. The sulfur-bearing amino acids, L-methione and L-cystine, were not appreciably utilized by any of the bacteria isolated. (Lisk-FIRL)
W78-08505

BACTERIAL AEROSOLS RESULTING FROM SPRAY IRRIGATION WITH WASTEWATER,
Army Medical Bioengineering Research and Development Laboratory, Fort Detrick, MD.

H. T. Bausum, S. A. Schaub, M. J. Small, J. A. Highfill, and C. A. Sorber.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A028 359, Price codes: A07 in paper copy, A01 in microfiche. Technical Report 7602, June 1976. 143 p, 16 fig, 11 tab, 318 ref.

Descriptors: *Aerobic bacteria, *Aerosols, *Sprinkler irrigation, *Waste water disposal, *Coliforms, Mathematical models, Chlorination, Disinfection, Domestic wastes, Return flow, Application methods, Waste water treatment.

Air-borne bacteria resulting from spray irrigation with chlorinated and unchlorinated waste water were quantified in on-site investigations at Ft. Huachuca, Arizona and in laboratory experiments. Air sampling equipment was adapted for detection of the aerobic and indicator bacteria present in treated and untreated effluent from the army installation. Aerobic bacteria reached a maximum aerosol density of 1,630/cu m nearest the spray irrigation source; bacterial aerosols from chlorinated effluent were as high as 20/cu m close to the source. Coliforms comprised 0.5% of the total aerobic bacteria, with half of the coliform population represented by Klebsiella. Conditions of low wind, atmospheric stability, and darkness increased the aerosol densities of the bacteria. A mathematical model, used in conjunction with flourescein tracer data, predicted that 0.3% of the applied waste water aerosolized. With this aerosol figure, the model estimated that a downwind distance of 518-1,800 m from the source would be required to reduce air-borne bacteria to background levels. The diameter of viable aerosol bacterial aerosols averaged 4.5 micrometers, indicating that more than half were small enough for human aspiration. Laboratory tests determined the viability of enteric bacteria under varying humidity. (Lisk-FIRL)
W78-08518

SUBLETHAL EFFECTS OF PETROLEUM ON MACOMA BALTHICA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5C.
W78-08521

THE NBS PROGRAM FOR STANDARDS FOR TRACE ORGANIC ANALYSIS IN THE MARINE ENVIRONMENT,
National Bureau of Standards, Washington, D.C. Analytical Chemistry Div.
H. S. Hertz, S. N. Chesler, and W. E. May.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 227-242, 12 fig.

Descriptors: *Pollutant identification, *Analytical techniques, *Water pollution, *Organic compounds, Baseline studies, Trace elements, *Outer Continental Shelf, Petroleum.

The National Bureau of Standards (NBS) is currently conducting a research program to develop standards for trace organic analysis in the marine environment. In this paper, the results of these analyses for petroleum-in-sediment and petroleum-in-biota reference materials, marker compounds, and concentration techniques for polar organic materials are summarized. (See also W78-08520) (Sinha - OEIS)
W78-08536

THE NBS PROGRAM FOR STANDARDS FOR TRACE INORGANIC ANALYSIS IN THE MARINE ENVIRONMENT,
National Bureau of Standards, Washington, D.C. Analytical Chemistry Div.
I. L. Barnes, H. L. Rook, and T. J. Murphy.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 243-257, 6 fig.

Descriptors: *Inorganic compounds, *Pollutant identification, *Water quality, Monitoring, Baseline studies, Analytical techniques, Neutron activation, *Trace elements, *Outer Continental Shelf, Energy resources.

The Analytical Chemistry Division of the National Bureau of Standards (NBS) has been conducting a research program concerning the production of new standard reference materials and the determination of new materials that can be used as standards in the analysis of inorganic elements. This paper focuses on the use of raw materials, products, and residues of coal conversion and oil shale processes for possible standard reference materials; the development of standards for monitoring water quality associated with energy production; and the development of a resin disk preconcentration method and an improved analytical capability based on neutron activation. (See also W78-08520) (Sinha - OEIS)
W78-08537

STANDARDIZATION AND INTERCALIBRATION TECHNIQUES FOR MARINE MONITORING,
National Ocean Survey, Rockville, MD. Test and Evaluation Lab.
M. A. Basileo.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 259-269.

Descriptors: *Baseline studies, *Water quality standards, *Monitoring, *Water pollution, Environmental effects, Water quality, Calibration, Instrumentation, *Pollutant identification, *Outer Continental Shelf, Standardization, Intercalibration techniques.

The objective of this project is to develop standardization and intercalibration techniques to assess the quality of marine environmental data. The tasks within the project are directed towards developing the capability to define the uncertainties or error boundaries associated with data obtained from environmental measurement systems. The project is composed of two tasks: standards development and investigations. (See also W78-08520) (Sinha - OEIS)
W78-08538

THE UNDERWAY WATER SAMPLING SYSTEM,
National Ocean Survey, Rockville, MD. Engineering Development Lab.
C. D. Kearse, R. New, and D. Enabnit.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. 283-300, 2 fig.

Descriptors: *Water sampling, *Measurement, Instrumentation, Baseline studies, Data processing, Oil spills, Navigation, *Pollutant identification, *Outer Continental Shelf, Oceanographic data, Underway sampling, Thermal plumes.

An underway water sampling system (UWSS) to aid in characterizing and monitoring the regions subjected to energy-related pollution is a complete shipboard instrument system designed to acquire, measure, display, and store oceanographic, meteorological, and navigation data while the ship is continuously underway. The system has the following major components: a water measurement subsystem (a towed sensor array or instrumented undulating fish plus a water pumping system) designed to collect oceanographic data and water samples; a navigation, data handling, real-time processing, and display; and a current/depth measurement subsystem to remotely measure ocean currents. This paper summarizes the efforts to date, describes the present status of individual tasks, and discusses the future of the project. (See also W78-08520) (Sinha-OEIS)
W78-08540

SHIPBOARD ENVIRONMENTAL DATA ACQUISITION SYSTEM,
National Weather Service, Silver Spring, MD.
D. W. Downen, and R. R. Reynolds.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p. 301-304, 1 fig.

Descriptors: *Data processing, *Measurement, *Monitoring, *Weather forecasting, *Oil spills, Baseline studies, Water pollution, Environmental effects, Pollutant identification, Remote sensing, *Outer Continental Shelf, Data acquisition, Shipboard instrumentation, Petroleum, Oil transport, Shipboard Environmental Data Acquisition System(SEAS).

The National Weather Service is developing an automated environmental data observation system for shipboard use. Known as the Shipboard Environmental Data Acquisition System (SEAS), this system will provide real-time monitoring of meteorlogical and oceanographic parameters. It will be operated on board various ships (e.g., oil tankers, merchant ships), and the observed environmental data will be transmitted via satellite communications to NWS in Suitland, Maryland. The SEAS will provide routine observations from relatively data-sparse oceanic areas. Correlation of these data with additional environmental data will result in improved weather forecasts and warning services. Many energy and pollution-related activities will benefit from SEAS. It will be used as input to the oil spill concentration and trajectory forecast model currently under development used in providing more efficient clean-up operations in the event of a spill. (See also W78-08520) (Sinha-OEIS)
W78-08541

THE HARMONIZATION OF THE MONITORING OF THE QUALITY OF INLAND FRESH WATER,
Department of the Environment, London (England).
E. A. Simpson.
Journal of the Institution of Water Engineers and Scientists, Vol 32, No 1, p 45-56, January 1978. 3 tab, 16 ref.

Descriptors: *Pollutant identification, *Water quality, *Monitoring, *Coordination, *Water analysis, Freshwater, Networks, Sampling, Water sampling, Quality control testing procedures, Methodology, Reliability, Data processing, Control, Testing, Foreign countries, Foreign research, *Great Britain.

In the United Kingdom, the need to monitor the quality of all but the smallest rivers as they enter tidal waters has been established. Informtion is required both to satisfy international obligations and to provide information on river quality. To meet this need, the harmonized monitoring scheme was set up. A network of sampling points has been established which will allow all important rivers to be sampled points has been established which will allow all improtant rivers to be sampled at, or a little above, the tidal limit. A similar network has been established for major tributaries, with the sampling points being at the confluence or a little way up the tributary from it. Nearly all sampling points are associated with flow-gaging facili-

ties so that mass flow as well as concentration can be measured. The scheme lays great stress on the need to produce results of known and adequate accuracy. To ensure that adequate accuracy is maintained, the harmonized monitoring scheme includes a continuing inter-laboratory calibration of participating laboratories. The size of the scheme has made it necessary to use a computer to handle the volume of data produced and to define exactly the determinands measured. However, results are sought only for those determinands which are significant at the individual sampling points. Experience suggests that there may well be other requirements for the scheme which have not yet been identified. However, the scheme has been designed to operate flexibly and to be capable of extention as needed. (Humphreys-ISWS)
W78-08548

OPTICAL MONITORING OF EFFLUENT WATER POLLUTION-ESPECIALLY TO MEASURE PETROLEUM CONTAMINANTS IN WATER FROM TANKER HOLDS.
French Patent FR 2353-210. Issued January 27, 1978. Derwent French Patents Abstracts, Vol. A, No. 11, p 7, April, 1978.

Descriptors: *Oil wastes, *Ultraviolet radiaton, *Infrared radiation, *Patents, *Instrumentation, Measurement, Pressure head, Ships, Design data, Industrial wastes.

A patent has been issued for an oil pollutant monitoring device employing ultraviolet fluorescence and infrared irradiation. The system is utilized for detecting petroleum contamination in water. A sheet of water falls freely under a constant pressure head through a rectangular nozzle with extended sides. Ultraviolet fluorescence emitted by the water and ultraviolet and infrared irradiation absorbed by the water are used as a mearure of heavy and light petroleum contamination and suspended solids. The data is received on photocell-photomultipliers and transmitted to a recorder-controller which activates a recycling valve or alarm. The water in the nozzle is stabilized so that monitoring is not influenced by external vibrations or motion. (Lisk-FIRL)
W78-08553

APPARATUS FOR DETECTING PROPORTION OF OIL IN OIL/WATER MIXTURES,
Marine Construction and Design Co., Seattle, WA. (Assignee).
For primary bibliographic entry see Field 5G.
W78-08596

HYDROXYMETHANESULPHINATE SALTS AND RELATED DECOMPOSITON PRODUCTS IN WASTEWATER,
Florence Univ., (Italy). Inst. of Analytical Chemistry.
E. B. Piccardi, and P. L. Cellini.
Water, Air, and Soil Pollution, Vol. 9, No. 3, p 301-307, 1978. 2 fig, 13 ref.

Descriptors: *Analytical techniques, *Chemical wastes, *Textiles, *Bleaching wastes, *Oxidation, Pollutant identification, Polarograhic analysis, Volumetric analysis, Zinc, Sulfides, Sulfite liquors, Alkalinity, Chemical analysis, Waste water treatment, Industrial wastes.

Electroscan polarograhy was used to quantify HCHO, Zn, and sulfites during the decomposition of hydroxymethanesulfinate (HMS) contained in waste water from textile manufacturing. The HMS was purified to 98% for all experiments by recrystallization, washing with water and ethanol, and vacuum drying. A 35% formaldehyde solution was employed for acidimetric HMS analysis. Polarographic anodic waves were produced by the oxidation of the HMS ion in an alkaline electrolyte. A linear relationship between the limiting current and the HMS concentration was established in 0.1 or 1.0 M NaOH. S(-2), HMS, HCHO, and Zn(+2) were readily distinguished with a current-potential scan in 0.1 M NaOH. The concentrations of these products were calculated by polarographic techniques. Sulfites produced well defined waves in acidic solutions of 0.1-1.0 M nitrid acid; HMS, HCHO, and Zn were detected in the same sample when the solution was made Alkaline. HMS was indirectly identified through HCHO released in the I2 solution in the presence of high concentrations of S202(-2) and S204(-2). (Lisk-FIRL)
W78-08612

SPECTROGRAPHIC ANALYSIS OF WASTE WATER (ANALISIS ESPECTROGRAFICO DE AGUAS RESIDUALES),
Junta de Energia Nuclear, Madrid (Spain). Div. de Quimicay Medio Ambiente.
F. A. Alduan, and C. Capdevila.
Anales de Quimica, Vol. 74, p 43-47, January, 1978. 10 tab, 1 ref.

Descriptors: *Spectroscopy, *Heavy metals, *Electrodes, *Sodium, *Calcium, Chromium, *Pollutant identification, Copper, Iron, Manganese, Lead, Analytical techniques, Waste water treatment, Industrial wastes.

Lithium and thallium were evaluated as spectrochemical buffers to reduce the influence of sodium and calcium on spectrographic analysis of heavy metals in waste waters. Concentrations of up to 1,000 mg/liter sodium and 300 mg/liter calcium interfered wit analyses for chromium, copper, iron, manganese, and lead in waste waters using graphite spark excitation. Barium, cesium, indium, lanthanum, lithium, strontium, and thallium were tested as buffering agents to suppress the sodium and calcium interferences. A solution containing 50% lithium and 50% thallium increased the accuracy of the analysis by 25%. While sodium and calcium improved the line intensities of the heavy metals in waste water when graphite or gold electrodes were employed, they interfered with the line intensities when copper or silver electrodes were used. (Lisk-FIRL)
W78-08616

DETERMINATION OF BLACK LIQUOR SOLIDS CONTENT,
Combustion Engineering, Inc., Windsor, CT.
W. Nelson, and C. E. Thompson.
Tappi, Vol. 61, No. 5, p 108-109, May, 1978.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Analytical techniques, *Diatomaceous earth, *Solid wastes, Drying, Sands, Silicates, Equilibrium, Waste water treatment, Industrial wastes.

Surface extension of kraft black liquors with diatomaceous earth composed of 90% chemically inert silica prevented the formation of a surface crust and reduced the drying time in comparison with the TAPPI method of sand or Alundum extension to measure black liquor solids. The optimum combinations of ingredients for black liquor drying was 3 g of liquor with 50% solids content, 5 ml water, and 5 g diatomaceous earth. The equilibrium weight loss of the black liquor samples was reached after 4 hrs of drying at 105C, compared to 10 hours required for sand-extended liquor. The diatomaceous earth-extended liquor remaned powdery after drying; the sand-extended sample developed a hard crust. Five hours of drying at 105C was recommended to ensure complete drying. The diatomaceous earth-extension of the black liquor increased the accuracy of solids content calculations by an average of 2.5% (absolute) over the TAPPI recommended procedures. (Lisk-FIRL)
W78-08619

DETERMINATION OF POLYTHIONATES AND THIOSULPHATE IN MINING EFFLUENTS AND MILL CIRCUIT SOLUTIONS,
Canada Centre for Mineral and Energy Technology, Ottawa (Ontario).
R. Makhija, and A. Hitchen.
Talanta, Vol 25, No 2, p 79-84, 1978. 8 tab, 12 ref.

Descriptors: *Sulfite liquors, *Mine drainage, *Analytical techniques, *Volumetric analysis, *Colorimetry, Sodium compounds, Electrodes, Phenols, Mills, Mine wastes, Industrial wastes.

Mercuric chloride acidimetric titration was accurate for detecting polythionates and thiosulfate concentrations to 0.1 mg thio salt in mining effluents and mill circuit solutions. The acidimetric titration for potassium triand tetrathionate and sodium thiosulfate was compared with cnventional colorimetric analysis. In the absence of sulfite, 0.10-25 mg S203(-2) was diluted with 30 ml distilled H20 and stirred in the presence of pH electrodes. The mixture was titrated with 0.005 N H2S04 or NaOH to pH 4.3 or, in the presence of buffer species, to pH 8.2. Five ml of 2% mercuric chloride was added, followed by dropwise additions of 20% KI until the orange precipitate disappeared. The pH electrodes were replaced and the solution was titrated with NaOH or H2S04 to the pH 4.3 endpoint. In the presence of sulfite, 1 ml of 37-38% formaldehyde/mg of sulfite was added to the polythioate solution and titrated to pH 8.2 with NaOH. Concentrations of S203(-2) and polythionates were calculated according to the NaOH volume used during titration. Quantitative results for thio salt contained in mining effluents and mill circuit solutions were in agreement with colorimetric data. (Lisk-FIRL)
W78-08625

ACUTE TOXICITY OF DIISOPROPYLMETHYL PHOSPHONATE AND DICYCLOPENTADIENE TO AQUATIC ORGANISMS,
E G and G Bionomics, Wareham, MA.
For primary bibliographic entry see Field 5C.
W78-08631

LABORATORY EVALUATION OF THE TOXICITY OF NITROCELLULOSE TO AQUATIC ORGANISMS,
E G and G, Bionomics, Wareham, MA.
For primary bibliographic entry see Field 5C.
W78-08641

EFFLUENT MONITORING PROCEDURES: NUTRIENTS,
Environmental Protection Agency, Cincinnati, OH. Municipal Operations and Training Div.
A. D. Kroner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 290, Price codes: A14 in paper copy, A01 in microfiche. Report EPA 430/1-76-006, June 1976. 368 p.

Descriptors: *Nutrients, Phosphorous, Chemical oxygen demand, Nitrates, Nitrites, Nitrogen, Oil, Oxygen demand, Spectrophotometer, *Analytical techniques, Monitoring, *Methodology, *Effluent monitoring procedure, *Reference manual, *Calibration graphs, *Student reference manual, Nutrient reference manual.

A manual for students in a chemistry course designed for the treatment plant operator or technician who is required to monitor effluent discharges under a National Pollutant Discharge Elimination System permit and who has had little or no previous experience in wastewater analysis. The procedures are for phosphorous; chemical oxygen demand; Kjeldahl Nitrogen; Ammonia, Nitrate and Nitrite as Nitrogen; oil and Grease. Also procedures for related basic skills: Using a spectrophotometer and preparing calibration graphs. (EIS-Katz)
W78-08642

ENVIRONMENTAL SAMPLING IN THE PANAMA CANAL ZONE,
Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD.
C. C. Roan, and J. H. Vinopal.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A034 765, Price codes: A02 in paper copy, A01 in microfiche. Pesticide Monitoring Special Study No. 44-0102-77, December 1976. 11 p, 3 tab.

Descriptors: *Pesticides, *On-site investigations, On-site survey, Water pollution effects, *Sampling, Water, Sediment, Soils, Aquatic environment, *Chlorinated hydrocarbon pesticides, *Organophosphorous pesticides, Carbamate pesticides, DDD, DDT, DDE, Chlordane, Dieldrin, Cyclodienes, *Panama Canal.

This is a report evaluating the pesticide residue data obtained from environmental samples of water, sediment, and soil collected during CY 73 - CY 75 from the Canal Zone for their adequacy in preparing an environmental pesticide profile. The water and sediment data do not indicate any significant contamination of the aquatic environment by persistent pesticides. The soil data, although not sufficiently complete, tentatively indicate that the disappearance of even persistent pesticides may be exceptionally rapid in the tropical climate of the Canal Zone. It was recommended that (1) biological specimens, including fish and nonmigratory birds collected during CY 77; and (2) additional soil samples be collected during CY 78 utilizing a stratified sampling plan. This report also discusses the nature and scope of pest management operations in the Canal Zone. (EIS-Katz)
W78-08643

A COMPUTER PROGRAM FOR THE ANALYSIS OF MACROINVERTEBRATE DATA FROM WATER QUALITY SURVEYS,
Army Armament Research and Development Command, Aberdeen Proving Ground, MD. Chemical Systems Lab.
P. A. Cimba, A. E. Asaki, J. G. Pearson, and E. S. Bender.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A040 383, Price codes: A03 in paper copy, A01 in microfiche. Army Armament Research and Development Command, Report PAA 5764114, May 1977. 30 p, 2 fig, 7 ref.

Descriptors: *Methodology, *Benthos, Invertebrates, Water quality, Data processing, *Aquatic populations, Aquatic productivity, Aquatic habitats, *Aquatic insects, Surveys, Computer programs, Analysis, *Analytical techniques, DICALC, *Species diversity, Absolute abundance, *Macroinvertebrate indices, Relative abundance.

Macroinvertebrate communities are commonly analyzed by calculating species diversity and relative abundance. With the modifications presented here, DICALC, using these widely accepted methods, permits the user to swiftly calculate species diversity and relative abundance. In addition, data can be expressed in standard density units (number of individuals per square meter). The additional calculations of relative efficiency, redundancy, and relative maximum and minimum help the user to identify peculiarities about the distribution of individuals in each sample. (EIS-Katz)
W78-08646

SENSITIVITY OF VERTEBRATE EMBRYOS TO BORON COMPOUNDS,
Kentucky Univ., Lexington. School of Biological Science.
For primary bibliographic entry see Field 5C.
W78-08647

A DIRECT METHOD FOR THE DETERMINATION OF PHENOL IN NATURAL WATERS,
Aberdeen Proving Ground, MD.
L. M. McCormack, A. Goodman, A. R. Jones, and A. Silvestri.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A031 155, Price codes: A02 in paper copy, A01 in microfiche. Edgewood Arsenal Technical Report ED-TR-76048, October 1976. 17 p, 4 tab, 11 ref.

Descriptors: *Pollutant identification, *Phenols, Water quality, *Analytical methods, *Laboratory tests, Methodology, Industrial wastes, Chemical reactions, *Chemical wastes, Chemical analysis.

A rapid, direct procedure for the determination of phenol, sensitive in the microgram range, has been devised utilizing a modification of the Berthelot reaction. The method is especially applicable to water samples and requires no extraction or distillation. Phenol, as the limiting factor, produces a strong indophenol blue color, which is linear in the range of 1 to 5 micro g/ml. Challenge of the method with 33 potential water pollutants shows good specificity for phenols. (EIS-Katz)
W78-08650

RECOMMENDATIONS OF THE EPA/NBS WORKSHOP ON THE NATIONAL ENVIRONMENTAL SPECIMEN BANK,
National Bureau of Standards, Washington, DC. Analytical Chemistry Div.
H. L. Rook, and G. M. Goldstein.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 983, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Environmental Health Effects, Research Series, Report EPA 600/1-77-020, April 1977. 54 p, 4 tab, 1 fig, 22 ref.

Descriptors: Metals, *Monitoring, Path of pollutants, *Methodology, Trace elements, Chromium, Laboratory tests, Chemical analysis, Chemical wastes, Biological properties, Activation energy, Neutron activation analysis, Research and development, *Research priorities, *National Environmental Specimen Bank, Analytical research, Activation analysis, Biological matrices, *Standard reference materials.

On August 19 and 20, 1976, the National Bureau of Standards and the U.S. Environmental Protection Agency co-sponsored a Workshop to review technical developments and to make recommendations on implementation of the National Environmental Specimen Bank. The Workshop consisted of a review session where past considerations were discussed; a technical session where recent analytical research relevant to the sample bank was abstracted and discussed; and a planning session where planning and design of a prototype banking system was outlined. The workshop concluded that with the ever increasing influx of new man-made substances into our ecosystem, that formalized, systematic approach is needed to assess the environmental impact of these substances on a national as well as international level. The technology to initiate a pilot banking program is presently available and was formulated into a five-year pilot bank program. This program will be evaluated at each stage of development. (EIS-Katz)
W78-08652

DEVELOPMENT OF A KIT FOR DETECTION OF HAZARDOUS MATERIAL SPILLS INTO WATERWAYS,
Edgewood Arsenal, Aberdeen Proving Ground, MD.
A. Silvestri.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 610, Price codes: A04 in paper copy, A01 in microfiche. Special Publication ED-SP-76023, August 1976. 81 p, 7 tab, 2 fig, 20 ref.

Descriptors: *Pollutant identification, *Water quality, Water pollution effects, *Path of pollutants, Acidity, Alcohols, Alkalinity, Ammonia, Chlorides, Chlorine, Color, Conductivity, Enzymes, Fluorides, Hardness(Water), Metals, Nitrates, Odor, Phenols, Phosphates, Sulfates, Turbidity, Spectrophotometer, Methodology, On-site-investigation, Detection of spills.

Edgewood Arsenal, under a program sponsored by the Environmental Protection Agency, Edison, NJ, has developed a kit to detect hazardous material spills into waterways. The purpose of the program was to develop a man-portable field kit able to detect (not necessarily identify) as many contaminants in water in as low a concentration as possible. A field kit was designed containing a spectrophotometer, conductivity meter, pH meter, and a variety of accessory equipment and reagents. Prototype kits were fabricated and delivered to the Environmental Protection Agency along with engineering drawings, parts lists and manuals. (EIS-Katz)
W78-08658

VALIDITY OF LABORATORY TESTS FOR PREDICTING COPPER TOXICITY IN STREAMS,
Environmental Protection Agency, Cincinnati, OH.
J. R. Geckler, W. B. Horning, T. M. Neiheisel, Q. H. Pickering, and E. L. Robinson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 867, Price codes: A10 in paper copy, A01 in microfiche. Ecological Research Series, Report EPA 600/3-76-116, December 1976. 191 p, 59 tab, 41 fig, 40 ref.

Descriptors: *Copper, Metals, *Toxicity, *Mortality, *On-site investigations, Water quality, Freshwater fish, Sunfish, Laboratory tests, Ohio, *Water pollution effects, Benthos, Aquatic environment, Reproduction, Bioassay, Environmental effects, Sewage effluent, Darters, *Shayler Run, LC50, *Acute toxicity, *Chronic toxicity, Copper ion, Newtown fish toxicology station, Median lethal concentration, Clermont County, Ohio.

A field study was conducted on Shayler Run, in Clermont County, Ohio, to determine the effects of copper on stream biota. Copper was added to the stream for 33 months to mantain a concentration of 120 micro g/l., a concentration that was expected to adversely affect some species of fish and not others. This natural stream received sewage effluent containing a variety of compounds known to affect acute copper toxicity. All but one abundant species of fish in the stream and four of the five most abundant macroinvertebrates were adversely affected by exposure to copper. Direct effects on fish were death, avoidance, and restricted spawning. To determine the usefulness of laboratory toxicity tests when establishing water quality criteria for an aquatic ecosystem, acute and chronic tests with copper were conducted at the Newtown Fish Toxicology Station and on-site at Shayler Run with stream species and the fathead minnow. The acute toxicity of copper varied widely because of the water quality variations in the stream. The chronic tests underestimated the in-stream toxicity by about two times because only the effects of copper on survival, growth, and reproduction were measured. Agreement between the predictions from laboratory toxicity tests and the observed effect is surprisingly close considering the measurement errors involved. (EIS-Katz)
W78-08670

AN ASSESSMENT OF SAMPLING MORTALITY OF LARVAL FISHES,
Nebraska Univ., Lincoln. School of Life Sciences.
For primary bibliographic entry see Field 5C.
W78-08686

POLAROGRAPHIC STUDIES OF THE NATURE OF CADMIUM IN SCALLOP, OYSTER, AND LOBSTER,
Fisheries and Marine Service, halifax (Nova Scotia).
C.L. Chou, J. F. Uthe, and E. G. Zook.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 409-413, 1978. 4 fig, 2 tab, 17 ref.

Descriptors: *Pollutant identification, *Cadmium, *Shellfish, *Oyster, *Lobster, *Spectrophotometry, *Polarographic analysis, *Proteins, *Animal metabolism, *Commercial shellfish, *Animal physiology, Chemical analysis, Biochemistry, Metals, *Scallop, Tissue analysis, Bioaccumulation, *Metallothioneins.

Levels of free and bound forms of cadmium were determined in raw shellfish by use of differential pulse polarography and atomic absorption spectrophotometry. Both scallop (various species) and American lobster (Homarus americanus) muscle tissues contain no free cadmium. Oyster (various species), on the other hand, had a considerable percentage (approximately 50%) of its total cadmium present as free cadmium, a phenomena as yet unexplained. The detection limit for free cadmium was approximately 0.05 micrograms/g raw tissue. (EIS-Deal)
W78-08688

TOLERANCES OF FISHES TO DISSOLVED GAS SUPERSATURATION IN DEEP TANK BIOASSAYS,
Battelle, Pacific Northwest Lab., Richland, WA.
For primary bibliographic entry see Field 5C.
W78-08697

CHRONIC EFFECTS OF CADMIUM AND ZINC MIXTURES ON FLAGFISH (JORDANELLA FLORIDAE),
Environmental Research Lab., Duluth, MN.
For primary bibliographic entry see Field 5C.
W78-08698

EFFECTS OF WATER-SOLUBLE OIL FRACTIONS ON METABOLISM, GROWTH AND CARBON BUDGET OF THE SHRIMP CRANGON CRANGON,
Marine Lab., Aberdeen (Scotland)
For primary bibliographic entry see Field 5C.
W78-08700

A WATER SUPPLY DATA BASE,
Arizona Univ., Tucson. Management Information Systems.
For primary bibliographic entry see Field 7C.
W78-08726

THE OSMOTIC CONCENTRATION OF THE BLOOD PLASMA OF PLAICE (PLEURONECTES PLATESSA) FROM THREE HABITATS OF DIFFERENT SALINITY,
Delta Inst. for Hydrobiological Research, Yerseke (Netherlands).
For primary bibliographic entry see Field 5C.
W78-08760

THE EFFECTS OF PRECIPITATION ON AQUATIC AND TERRESTRIAL ECOSYSTEMS: A PROPOSED PRECIPITATION CHEMISTRY NETWORK, DEPT. OF ENVIRONMENTAL SCIENCES.
Virginia Univ., Charlottesville.
For primary bibliographic entry see Field 5C.
W78-08762

5B. Sources Of Pollution

TRACE METALS IN THE ENVIRONMENT,
New York Univ., NY. Task Force for Research Planning in Environmental Health Sciences (2nd).
H. L. Cannon, and H. W. Lakin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 428, Price codes: A04 in paper copy, A01 in microfiche. Report No. NIH/NIEHS - 77/022, December, 1976. 72 p, 129 ref. 1-R13-ES 01470-01.

Descriptors: *Public health, *Food chains, *Path of pollutants, *Soil contamination, *Vegetation, *Soil environment, Zinc, Arsenic compounds, Asbestos, Beryllium, Mercury, Nickel, Lead, Cadmium, Chromium, Copper, Molybdenum, Pollutant identification, *Trace metals, Environmental distribution, Essential trace elements, Toxin transport, Selenium.

The environmental distribution and the passage through the food chain of toxic elements and of essential trace elements that are known to cause health problems when a deficiency exists are addressed. Toxic elements discussed from the standpoint of their presence in the environment, their transport, and their effects on plants and people include: arsenic, asbestos minerals, beryllium, mercury, nickel, cadmium and lead. Trace elements essential to health that are discussed, are: zinc, selenium, chromium, copper and molybdenum. Interactions of various combinations of elements in soils, plants and humans are described. Following the discussion of each element, a list of recommendations for research necessary to gain a better understanding of these materials is provided. (Seip-IPA)
W78-08226

MONITORING OF TRACE CONSTITUENTS DURING PCB RECOVERY DREDGING OPERATIONS: DUWAMISH WATERWAY,
Environmental Protection Agency, Seattle, WA. Surveillance and Analysis Div.
J. N. Blazevich, A. R. Gahler, G. J. Vasconcelos, R. H. Rieck, and S. V. W. Pope.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 282, Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA 910/9-77-039, August, 1977. 149 p, 37 fig, 65 tab, 19 ref, 6 append.

Descriptors: *Polychlorinated biphenyls, Aroclors, *Washington, *Trace elements, *Dredging, *Sediments, *Water pollution treatment, Bacteria, Filtration, Adsorption, *Pollutant identification, *Spills(Aroclor 1242), *Duwamish River(WA), Elutriate test.

The monitoring program conducted after a spill of 255 gallons of transformer fluid, Aroclor 1242, into the Duwamish River in Seattle, Washington, is described. A detailed evaluation is presented of data acquired prior to, during, and after recovery operations. An initial recovery effort conducted by EPA resulted in a 30% removal of the PCB. The Corps of Engineers removed the remaining Aroclor using a Pneuma dredge, thus increasing the total PCB recovered to approximately 92%. The second recovery effort was conducted without significant redistribution of toxic materials and bacteria associated with the dredged sediments. No appreciable amount of PCB returned from the disposal ponds to the river because of the design of the land disposal area and the use of a filtration-adsorption treatment unit. Water, which drained from the dredged spoils in the disposal pond, contained some Mn, N-NH3, N-TKN, oil and grease, and total coliform, but only traces of Cd, Fe, Zn and total P. Apparently most of the pollutants and bacteria were associated with or scavenged by particulate matter and settled in the disposal ponds. Only small concentrations of toxic materials, nutrients, and suspended solids were observed to be released into the overlying river water during dredging operations. The release of pollutants from sediments during dredging could be only partially predicted by use of the elutriate test and evaluation of the interstitial water. The elutriate test was valid for most metals, nutrients, and oil and grease, but both tests failed to predict the amount of PCB released. (Seip-IPA)
W78-08230

A QUANTITATIVE STUDY OF THE DIFFUSE SOURCE LOADINGS OF CHESAPEAKE BAY, (PROGRESS REPORT),
Smithsonian Institution, Edgewater, MD. Chesapeake Bay Center for Environmental Studies.
D. L. Correll, M. A. Faust, J. W. Pierce, J. Stevenson, and K. Lomax.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 231, Price codes: A02 in paper copy, A01 in microfiche. Report No. NSF/RA - 761357, November, 1976. 13 p. Chesapeake Bay Research Consortium, Inc., Baltimore, MD. ENV7622045.

Descriptors: *Chesapeake Bay, *Nutrients, *Organic compounds, Land use, *Bacteria, *Mineralogy, *Water quality, *Instrumentation, *Monitoring, Pollutant identification, Water pollution, *Pollutant loading rates, Land use effects.

Research conducted by the Chesapeake Research Consortium during the period from December 1, 1975 to November 30, 1976 is reported. The research of organic and mineral particulates, and of indicators of bacterial pathogens on a seasonal basis, per unit of watershed area of a series of land use types prevalent in the Chesapeake Bay region; (2) test whether expedited land use mapping and area yield loading rates measured at intensive study locations can be used to calculate diffuse source loading of Chesapeake Bay from other control areas of its watershed; and (3) develop a tested methodology, of regional scope, for the prediction of land use effects via diffuse source pollution upon water quality in Chesapeake Bay. Described are the construction and instrumentation of the monitoring stations: Rhode River Watersheds, Choptank River Watersheds, and Patuxent River Watersheds. A status report on other program activities is included. (Seip-IPA)
W78-08234

REMOTE SENSING OF EFFECTS OF LAND USE PRACTICES ON WATER QUALITY,
Kentucky Univ., Lexington. Dept. Forestry.
D. H. Graves, and G. B. Coltharp.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-26581, Price codes: A08 in paper copy, A01 in microfiche. Final Report, May 31, 1977. 159 p, 30 fig, 25 tab, 23 ref, 4 append. NAS 8-31006.

Descriptors: *Land use, *Areal hydrogeology, Water quality, *Aerial sensing, *Aerial photography, Satellites(Artificial), *Forest watersheds, *Strip mines, *Vegetation, *Kentucky, Aircraft, Remote sensing, Cost analysis, Watershed management, Densitometry, Color additive viewing, *Landsat, *Land use change, Vegetation survey, *Cumberland Plateau(KY), Linear regression analysis.

An intensive 2-year study of 6 watersheds in the Cumberland Plateau region of eastern Kentucky determined the utility of manual densitometry and color additive viewing of aircraft and LANDSAT transparencies for monitoring land use and land use change. The study area was comprised of reclaimed surface-mined land and forestland. Manual photo interpretation techniques stratified the study area into vegetation types. An intensive ground survey was undertaken to ascertain kind, size, and extent of vegetation present in each. Values obtained from subsequent densitometric sampling of NASA research aircraft and LANDSAT imagery were examined for correlation and predictability of corresponding vegetation types.

Densitometer filter-aperture combinations were examined for determination of vegetation classification success. Densitometric values were compared with sample water quality values obtained from the watersheds. Linear regression equations were derived for water quality-densitometry and water quality-percent disturbed land relationships. Manual densitometry of LANDSAT imagery merely provided discrimination between wholly forested and partially surface-mined watersheds, while that of seasonal color infrared imagery yielded good classification of 8 broad vegetation categories of forested and reclaimed surface mines. Some correlation between densitometric data and water quality parameters appears to exist. (Seip-IPA)
W78-08237

SATELLITE REMOTE SENSING STUDY OF THE TRANS-BOUNDARY MOVEMENT OF POLLUTANTS,
Environmental Research Inst. of Michigan, Ann Arbor.
C. T. Wezernak, and D. R. Lyzenga.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 069, Price codes: A03 in paper copy, A01 in microfiche. Report No EPA-600/3-77-056, May, 1977. 17 p, 7 fig, 4 ref. R803671.

Descriptors: *Remote sensing, Satellites(Artificial), *Suspended solids, *Phytoplankton, Water circulation, *Water quality, Sampling, *Monitoring, *Pollutant identification, Chlorophyll, Secchi disks, Turbidity, Sediments, Surface waters, *Path of pollutants, Earth Resources Technology Satellite, LANDSAT, *Lake Erie, *Lake Huron, Surface circulation, Transparency, Phytoplankton blooms, Surface chlorophyll.

Limited analysis of ERTS (LANDSAT) data of the western basin of Lake Erie and the southern portion of Lake Huron was performed to depict the large-scale movement of water masses (as manifested in terms of suspended solids) and to demonstrate the use of ERTS data in large lakes monitoring. Such data, recorded on computer compatible tapes, were processed to display surface circulation features, surface suspended solids distribution, surface chlorophyll distribution, and secchi disc transparency. Four broad ERTS (LANDSAT) bands (spanning the spectral range 0.5 - 1.1 micrometer) offer a water quality measurements potential which is essentially restricted to suspended solids, turbidity, transparency, and the detection of phytoplankton blooms. Large variance in suspended sediment concentration constitutes an interference in the processing of data to display chlorophyll levels; since ambiguities cannot be resolved solely on the basis of LANDSAT data analysis, reference to ground truth measurements for calibration purposes is necessary. Data acquired from space and ship data are complimentary and neither can substitute for the other. Large area coverage provided from space can serve to provide unity to data collected by conventional point sampling and facilitate the interpretation of data collected by conventional methods. A continuing program of analysis of LANDSAT data for the two study areas is recommended. Repeat data under a variety of wind and lake-state conditions would contribute significantly to the information data base, facilitate interpretation of point sampled data, and aid in trend analysis. (Seip-IPA)
W78-08239

THERMAL REMOTE SENSING CALIBRATION TECHNIQUES,
Calspan Corp., Buffalo, NY.
For primary bibliographic entry see Field 7B.
W78-08241

THE MISSOURI LEAD STUDY: AN INTERDISCIPLINARY INVESTIGATION OF ENVIRONMENTAL POLLUTION BY LEAD AND OTHER HEAVY METALS FROM INDUSTRIAL DEVELOPMENT IN THE NEW LEAD BELT OF SOUTHEASTERN MISSOURI. VOLUME I,
Missouri Univ.-Rolla; and Missouri Univ.-Columbia.
E. Bolter, N. L. Gale, D. D. Hemphill, J. G. Jennett, and S. R. Koirtyohann.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 242, Price codes: A24 in paper copy, A01 in microfiche. Final Progress Report, 1977. Wixson, B. G., Ed. 543 p, 104 fig, 85 yab, 224 ref. NSF AEN 74-29935-A01.

Descriptors: *Lead, *Mining, Environmental effects, *Missouri, *Heavy metals, *Trace elements, Water quality, Air quality, *Soil analysis, *Air pollution, Water pollution sources, *Analytical techniques, *Pollutant identification, Waste water treatment, Aquatic life, Vegetation effects, Water pollution effects, Toxicity, Chemical analysis, Mineralogy, Lead smelter, Lead refinery, *Lead mining.

A 7-year interdisciplinary research project to study trace contaminants associated with the production of lead in Missouri is summarized. Sources of trace metals in the environment were found to be associated with the mining-milling operations, transporting ores, and the smelter-refinery process. General topics include: (1) a description of the study area, (2) analytical techniques, (3) air quality, (4) soils and geochemical studies, (5) water quality studies, and (6) biological aspects of water quality. Specific subjects addressed include: (1) information storage and retrieval systems, (2) transport and distribution of heavy metal particulates around a primary lead smelter, (3) distribution patterns of heavy metals near sources, (4) chemical and mineralogical properties of baghouse and flue dusts, (5) formation of heavy metal-humic acid complexes in soils, (6) toxicity of milling reagents in the aquatic ecosystem, (7) sorption and desorption by soils, (8) industrial waste treatment, (9) physical-chemical water quality studies, (10) concentration of heavy metals in vegetation, (11) toxicity of reagents to aquatic life, and (12) the nature of the association between heavy metals and exposed biota. Biological effects of mine-mill waste treatment systems are contrasted for tailings ponds, recycling, and meander methods. (Seip-IPA)
W78-08243

A PRELIMINARY ASSESSMENT OF THE ENVIRONMENTAL IMPACTS FROM OIL SHALE DEVELOPMENTS,
TRW, Inc., Redondo Beach, CA. Environmental Engineering, Div.
For primary bibliographic entry see Field 5C.
W78-08246

TRANSURANICS IN NATURAL ENVIRONMENTS.
Energy Research and Development Administration, Las Vegas.
Available from the National Technical Information Service, Springfield, VA 22161 as NVO-178, Price codes: A99 in paper copy, A01 in microfiche. The Nevada Applied Ecology Group Symposium on the Dynamics of Transuranics in Terrestrial and Aquatic Environments, October, 1976, Gatlinburg, TN, White, M. G., and Dunaway, P. B., Eds., June, 1977. 710 p, 120 fig, 113 tab, 1115 ref, 1 append.

Descriptors: *Radioactivity effects, *Radioisotopes, Environmental effects, *Absorption, *Digestion, *Distribution, Water pollution effects, Radioactive wastes, *Vegetation effects, *Soil contamination effects, *Aquatic environment, Statistics, Analytical techniques, Microorganisms, Animal pathology, Ecology, Pollutant identification, *Transuranics, *Plutonium, *Aquatic effects.

The symposium was planned to bring about a concerted review and evaluation of the current status of the environmental problem of transuranics and the associated body of information available to investigators involved in studies of environmental transuranics. The papers are divided into the following subject areas: (1) transuranics in terrestrial environments, including soils research; microorganism research; resuspension and particle research; vegetation research; and animal research, field and laboratory studies; (2) transuranics research in aquatic environments; (3) analysis methodology for transuranics; and (4) transuranics in statistics and modeling. Papers selected for publication are coauthored by scientists and other technical and professional people from several national laboratories, academic institutions, private corporations, and government agencies. (See W78-08249 thru W78-08254) (Seip-IPA)
W78-08248

TRANSURANIC SPECIATION IN THE ENVIRONMENT,
Oak Ridge National LAb., TN.
E. A. Bondietti, and F. H. Sweeton.
In: Transuranics in Natural Environments, the Nevada Applied Ecology Group Symposium on the Dynamics of Transuranics by Terrestrial and Aquatic Environments, October, 1976, Gatlinburg, TN, p. 449-476, June, 1977. 6 fig, 5 tab, 39 ref.

Descriptors: *Radioactivity effects, *Vegetation effects, *Aquatic plants, Environmental effects, *Oxidation, *Absorption, *Distribution, Thermodynamics, Analytical techniques, Testing, Laboratory tests, Solubility, Uranium, *Transuranics, *Plutoniums, Oxidation states, Actinide oxidation, Actinide elements, Thorium.

The speciation of transuranium elements in the environment is discussed with particular emphasis on plutonium (Pu) and a focus on three areas: (1) the potential oxidation states of Pu in the environment as predicted by thermodynamic procedures; (2) oxidation states of Pu which have been evaluated in natural or laboratory solutions which have environmental relevance; and (3) the effect that oxidation state has on plant availability of the actinide elements. The thermodynamic evaluative approach is reviewed and examples are presented to exemplify the complexities of Pu chemistry in aqueous solutions. An example of the evaluation of Pu oxidation states (III, IV, V, and VI) in natural water is presented. The results, which indicate that Pu(III) and/or Pu(IV) dominated the soluble Pu fraction, are compared to a simple model involving the hydrolytic species of Pu(IV). Literature data are evaluated with respect to the Pu(IV) model. In all cases, the soluble concentrations of Pu in natural waters are in the reasonable agreement with the model. Dissolution studies with PuO2 are reviewed and data presented to demonstrate that oxidized Pu (Pu(V) and/or Pu(VI) species may be responsible for the relatively high Pu concentrations reported. The mechanism of oxidation appeared to be related to radiolytic effects. The plant uptake of transuranium elements is discussed and the influence of actinide oxidation state illustrated. Plutonium in one soil-plant uptake experiment resembled thorium more than uranium in plant availability. (See also W78-08248) (Seip-IPA)
W78-08249

DISTRIBUTION PATTERNS AND TRANSPORT OF PLUTONIUM IN FRESHWATER ENVIRONMENTS WITH EMPHASIS ON PRIMARY PRODUCERS,
Oak Ridge National Lab., TN. Environmental Sciences Div.
L. D. Eyman, and J. R. Trabalka.

In: Transuranics in Natural Environments, The Nevada Applied Ecology Group Symposium on the Dynamics of Transuranics by Terrestrial and Aquatic Environments, October, 1976, Gatlinburg, TN. p. 477-487, June, 1977. 1 fig, 2 tab, 17 ref.

Descriptors: *Radioactivity effects, Aquatic environment, *Primary productivity, *Phytoplankton, *Algae, *Sediments, *Kinetics, Water pollution effects, Absorption, Digestion, *Distribution, Radioactive wastes, Aquatic life, Analytical techniques, *Plutonium, *Transuranics, *Radioactive transport.

The distribution and transport of plutonium (Pu) in aquatic systems are reviewed with emphasis on the role of primary producers in transport processes. Terminology for expressing Pu concentration in aquatic biota that more clearly reflects the functional relationships that exist between abiotic and biotic components is suggested. The major repository for transuranic elements entering aquatic ecosystems is the bed sediment. Observed distribution coefficient (Kd) values for Pu across a wide spectrum of aquatic systems are surprisingly uniform (about 100,000). Pu arrives at the sediment as a result of association with and subsequent settling of suspended particulate matter. Thus, the major role of phytoplankton in Pu kinetics in aquatic systems has been postulated to be one of Pu removal from the water column. Very high affinity of Pu for particulate matter makes it difficult to use the traditional expression of Concentration Factor (CF) as a measure of the tendency of biota to accumulate this element. A proposed term, Trophic Transfer Factor (TTF), relates concentrations observed in biota to that of the sediment. The underlying assumption is that, due to the high Kd's, accumulation in tissues or organisms at higher trophic levels will be dominated by gut absorption rather than by direct uptake from water. Pu in most freshwater systems is transported predominately in association with suspended particulate matter. In some organically rich systems, a fraction of the hydrologically mobile Pu pool may be complexed or otherwise associated with naturally occurring organic acids. Although this association may result in increased environmental mobility, it does not appear to result in increased availability to aquatic biota. (See also W78-08248) (Seip-IPA)
W78-08250

PLUTONIUM-237: AN IMPORTANT RESEARCH TOOL FOR STUDIES OF ENVIRONMENTAL PLUTONIUM KINETICS,
Oak Ridge National Lab., TN. Environmental Sciences Div.
J. R. Trabalka, and L. D. Eyman.
In: Transuranics in Natural Environments, The Nevada Applied Ecology Group Symposium on the Dynamics of Transuranics by Terrestrial and Aquatic Environments, October, 1976, Gatlinburg, TN, p. 489-503, June, 1977. 3 fig, 7 tab, 16 ref.

Descriptors: *Radioactivity effects, *Tracers, *Channel catfish, *Absorption, *Digestion, Teleosts, Freshwater fishes, Radioactive wastes, *Radioactive tracers, *Plutonium-237, *Plutonium, Plutonium-237 citrate, Plutonium-237 fulvate, Plutonium-237 nitrate, Plutonium-237 hydroxide, Tissue analysis, Radioactivity assimilation, Biological assimilation, Kidneys, Ingestion.

The production and use of the photon-emitting isotope plutonium-237 (Pu-237) in investigations of the uptake, retention, and distribution of monomeric plutonium (IV) both in an aquatic vertebrate, the channel catfish, Ictalurus punctatus, and in a littoral aquatic micro-ecosystem, are detailed. The use of Pu-237 in environmental studies is discussed. Chelation can either enhance or reduce the uptake of ingested Pu relative to plutonium hydroxide (monomer) in channel catfish. The highest observed retention (whole body) at 63 days was 3.8% of ingested dose for Pu-237 citrate, while retention of the fulvate was 0.6%. Reduced uptake of the fulvate complex is due either to its high molecular weight (greater than 10,000) or to its stability in metabolic systems. Increased uptake of Pu-237 citrate is attributable to instability of the complex in metabolic systems. Tissue distribution studies reveal that relatively little of intracardially injected Pu citrate was excreted. Blood clearance rates were similar to those found in small mammals, with the Pu being primarily associated with the plasma protein transferrin. The fractional body burdens in bone, liver, and kidney 17 days after injection were 31%, 24%, and 9% of the injected dose, respectively. High kidney burdens relative to mammals are expected, since the kidney functions as the major site of homopoiesis in teleosts. Absence of significant excretion indicates that a short half-life component of elimination following gut clearance in intracastric injection (gavage) studies is due to Pu labeling of the gut. A distribution coefficient of 90,000 was observed for sediment in a year-old aquatic microsm spiked with Pu-237 nitrate. A materials balance at 90 days post-spike provided the following estimates: 0.001% in water, 0.04% in biota, and over 99.9% in sediments. (See also W78-08248) (Seip-IPA)
W78-08251

DISTRIBUTION OF PU-238 AND PU-239, 240 IN AQUATIC MACROPHYTES FROM A MIDWESTERN WATERSHED,
Argonne National Lab., IL. Radiological and Environmental Research Div.
C. W. Wayman, G. E. Bartelt, and J. J. Alberts.
In: Transuranics in Natural Environments, The Nevada Applied Ecology Group Symposium on the Dynamics of Transuranics by Terrestrial and Aquatic Environments, October, 1976, Gatlinburg, TN, p. 505-516, June, 1977. 6 tab, 10 ref.

Descriptors: *Radioactivity effects, *Aquatic plants, *Algae, *Absorption, *Digestion, *Cladophora, *Chlorophyta, *Phytoplankton, *Radioactive wastes, Water pollution effects, Plutonium, *Plutonium-238, *Plutonium-239, 240, Typha, Lemna, Potamogeton, Myriophyllum, *Great Miami River(OH), Radioactivity assimilation, Biological assimilation, Transuranics.

Aquatic macrophytes were collected in the Great Miami River, Ohio, above and below Miamisburg and in the canal and ponds, near the Mound Laboratory, which contain sediments of a high Plutonium (Pu) activity (about 1,000 - 1,000,000 times) relative to the river sediments. The aquatic plants from the Great Miami River have higher levels of Pu-238 downstream of Mound Laboratory than upstream. Cladophora concentrates plutonium more than the macrophytes, Potamogeton (pondweed) and Myriophyllum (water milfoil), which exhibit similar but lower total plutonium activities. Cladophora and macrophytes, Lemna (duckweed) and Typha (cattail), from the canal and ponds have elevated levels of Pu-238 which is attributed to higher levels in the sediments and water. Cladophora from the canal has higher total Pu-238 activity than Cladophora from the adjacent river; however, the canal algae have lower concentration factors. This may be indicating a saturation of surface sorption sites as opposed to active uptake by the plants. Typha and grass (grown in a dry canal bed) demonstrate that there is very little translocation of Pu-238 above the roots. Some differentiation, however, exists in Typha, with stems having slightly higher Pu-238 activities than spikes. Primary producers in an aquatic ecosystem are capable of scavenging and accumulating plutonium from the surrounding water and sediments to levels which are the highest observed in all biota. Concentration factors are reported and discussed with reference to possible modes of plutonium accumulation and distribution within the plants. (See also W78-08248) (Seip-IPA)
W78-08252

PU-238 AND PU-239, 240 DISTRIBUTION IN FISH AND INVERTEBRATES FROM THE GREAT MIAMI RIVER, OHIO,
Argonne National Lab., IL. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5C.
W78-08253

EFFECT OF NATURALLY OCCURRING ORGANICS ON PLUTONIUM-237 UPTAKE BY ALGAE AND BACTERIA,
Savannah River Ecology Lab., Aiken, SC.
For primary bibliographic entry see Field 5C.
W78-08254

FOLLOW-UP STUDY OF THE DISTRIBUTION AND FATE OF POLYCHLORINATED BIPHENYLS AND BENZENES IN SOIL AND GROUNDWATER SAMPLES AFTER AN ACCIDENTAL SPILL OF TRANSFORMER FLUIDS,
Environmental Protection Agency, Atlanta, GA. Air and Hazardous Materials Div.
A. J. Smith, Jr., G. J. Moein, and P. L. Stewart.
Available from the National Technial Information Service, Springfield, VA 22161 as PB-273 984, Price codes: A02 in paper copy, A01 in micorfiche. Report, presented to he 1976 National Conference on Control of Hazardous Material Spills, New Orleans, LA, 1976. 16 p, 1 tab, 12 ref.

Descriptors: *Polychlorinated biphenyls, *Biodegradation, *Microbial degradation, *Soil contamination, *Water pollution effects, Water pollution, Environmental effects, *Degradation(Decomposition), *Pollutant identification, Analytica techniques, Climates, Weather, Soil dynamics, Tennessee, *Polychlorinated benzenes, *Askarel, Spills, Spill residues.

The technical aspects of the fate of spill residuals after cleanup and after a 3-year period are briefly described. The accidental spill of approximately 1500 gallons of askarel (Aroclor 1254), which occurred in March 1973 in a rural area of East Tennessee, resulted in the environmental contamination of two watersheds; the chemical was dispersed through the soil both horizontally and vertically. Biodegradation of this polychlorinated biphenyl (PCB) and the various effects of weather, climate, and soil dynamics are investigated. The effects on microbial populations are assessed. (Seip-IPA)
W78-08255

SITE SELECTION AND DESIGN FOR MINIMIZING POLLUTION FROM UNDERGROUND COAL MINING OPERATIONS,
Alabama Univ., University.
For primary bibliographic entry see Field 5G.
W78-08261

FIELD AND LABORATORY METHODS APPLICABLE TO OVERBURDENS AND MINESOILS,
West Virginia Univ., Morgantown. Coll. of Agriculture and Forestry.
For primary bibliographic entry see Field 5A.
W78-08264

PHOSPHATE ADSORPTION-DESORPTION CHARACTERISTICS OF SUSPENDED SEDIMENTS IN THE MAUMEE RIVER BASIN OF OHIO,
Ohio Agricultural Research and Development Center, Wooster. Dept. of Agronomy.
D. B. Green, T. J. Logan, and N. E. Smeck.
Journal of Environmental Quality, Vol 7, No 2, p 208-212, April-June 1978. 3 fig, 3 tab, 15 ref.

Descriptors: *Phosphates, *Eutrophication, Water pollution, *Ohio, *Algae, *Phosphorous compounds, Fertilizers, Water properties, Water quality, Pollutants, Calcite, Surface runoff, Soil

erosion, Adsorption, Nuisance algae, Runoff, Nutrient removal, *Phosphate compounds, *Phosphate adsorption, *Phosphate desorption, *Maumee River Basin, *Suspended sediments, Langmuir adsorption isotherm.

Phosphorus (P) adsorption-desorption characteristics of Maumee River Basin suspended sediments were compared with those of Basin soils and stream bottom sediments. Suspended sediment contained more total P than either soils or bottom sediments. The increase in total P over soils is attributed to enrichment of P in sediment by selective erosion of fine particles and adsorption of P during fluvial transport. The suspended sediment had higher adsorption maxima than Basin soils, but lower than bottom sediments, and had lower adsorption energies than either soils or bottom sediments. Calcite content of the suspended sediments was correlated positively with total P, EPC (equilibrium P concentration), and P desorbed and negatively correlated with adsorption energy, implying that, although calcite is a sink for P, the adsorption is weak compared with other sites for P adsorption such as hydrous oxides of Fe and Al. (Henley-ISWS)
W78-08276

MODELING TECHNIQUES FOR ESTIMATING FECAL COLIFORMS IN ESTUARIES,
Oregon State Univ., Corvallis. Dept. of Food Science and Technology.
W. J. Kelch, and J. S. Lee.
Journal of the Water Pollution Control Federation, Vol 50, p 862-868, May 1978. 3 fig, 2 tab, 13 ref. NOAA 04615344004.

Descriptors: *Path of pollutants, *Coliforms, Water pollution, *Estuaries, *Mathematical models, *Bacteria, E coli, Microbiology, Water quality, Analytical techniques, Aquatic bacteria, Bays, Estuarine environment, Gulfs, Oceanography, Model studies, Aquatic environment.

Statistical models that predict the fecal coliform levels in an estuarine environment were developed using a computer assisted, multiple linear regression analysis program. Fecal coliforms isolated from Millipore HAWG Membranes were examined for their resistance to 12 antibiotics. Also, 135 independent variables were analyzed to determine their correlations with two dependent variables: bay fecal coliform count, and log bay fecal coliform count. Correlations were noted between these dependent variables and ambient temperature, precipitation, recreational use of the tributaries, antibiotic resistance levels, and fecal coliform counts in the tributaries. (Henley-ISWS)
W78-08278

EXPERIMENTS ON SURFACE BUOYANT JET,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
R. Wiuff.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY5, Proceedings Paper 13739, p 667-679, May 1978. 12 fig, 4 ref, 2 append.

Descriptors: *Jets, *Thermal pollution, *Water pollution, Laboratory tests, Flow , Velocity, Water temperature, Measurement, Entranment, Buoyancy, Froude number, Reynolds number, Density, Heated water, Plumes, Thermal plumes.

An experimental investigation of a surface buoyant jet was presented. The densimetric Froude number and the Reynolds number of the discharge channel were 3.6 and 33,000, respectively. Longitudinal and transverse velocities were measured by propellers and floating spheres and temperatures by thermistors. Measurements showed that the distributions of the longitudinal velocity in different cross sections were not similar. The same was observed for the density profiles. The influence of the damping effect on fluctuation measurements of the heat capacity of a thermistor and the resistance-capacity circuit in a propeller instrument was investigated. The fluctuation measurements were corrected according to the investigation. (Sims-ISWS)
W78-08280

MODEL FOR SHORE-ATTACHED THERMAL PLUMES IN RIVERS,
NALCO Environmental Sciences, Northbrook, IL.
P. P. Paily, and W. W. Sayre.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY5, Proceedings Paper 13762, p 709-723, May 1978. 8 figj, 1 tab, 18 ref, 2 append.

Descriptors: *Thermal pollution, *Rivers, *Powerplants, *Missouri River, Model studies, Mathematical models, Cooling water, Diffusion, Convection, Mixing, Turbulence, Temperature, Water temperature, Heated water, Flow, River flow, Streamflow, Water pollution, Plumes, Thermal plumes.

Side discharges of power plants thermal effluents into natural rivers cause the formation of thermal plumes, the shape and orientation of which depend upon both the discharge conditions and the ambient flow characteristics. When the turbulence level of the ambient flow is high, rapid vertical mixing is achieved between the effluent discharge and the river flow, and the thermal plume becomes shore-attached with the maximum temperatures within the plume occurring along the near shore. In order to determine the isotherm patterns within shore-attached thermal plumes, a solution of the depth-integrated steady-state convection-diffusion equation was obtained. The solution was cast in terms of space-cumulative discharge coordinates, thus allowing the inclusion of the effects of cross-channel flow induced by channel curvature in the model. (Sims-ISWS)
W78-08281

SOLUTE TRAVEL TIMES TO WELLS IN SINGLE OR MULTIPLE LAYERED AQUIFERS,
Iowa Agriculture and Home Economics Experimental Station, Ames.
For primary bibliographic entry see Field 2F.
W78-08288

USE OF TRACERS TO CONFIRM GROUNDWATER FLOW,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, NY. Dept. of Environmental Engineering.
D. B. Aulenbach, J. H. Bull, and B. C. Middlesworth.
Ground Water, Vol 16, No 3, p 149-157, May-June 1978. 16 fig, 1 tab, 8 ref.

Descriptors: *Tracers, *Groundwater flow, *Path of pollutants, *New York, *Sewage effluents, *Tritium, Rhodamine, Dye concentrations, Velocity, Infiltration, Sewage treatment, Saturated flow, *Lake George(NY).

Both rhodamine WT and tritium were found to be satisfactory tracers to determine the direction and velocity of flow of the secondary treated effluent from the Lake George Village Sewage Treatment Plant, New York. The effluent is applied to natural delta sand beds by the rapid infiltation technique. The average vertical velocity in the unsaturated portion of the sand bed was approximately 0.85 m/day (2.8 ft/day). The horizontal flow in the saturated aquifer reached between 10 and 12 m/day (33-40 ft/day°, The velocity appeared to decrease with distance from the sand infiltration beds, although this may have been the result of a change in direction of the major portion of the groundwater flow with the observation well not being in direct line of the direction of flow. Unfortunately, the dye could be traced only slightly less than half the distance from the sand infiltration beds to the seepage area adjacent to West Brook. Thus, a positive determination that the seepage consists primarily of sewage effluent, and the ultimate time of flow to the seepage could not be determined in this study. (Visocky-ISWS)
W78-08296

EVALUATION AND IMPROVEMENT OF QUALITY CHARACTERISTICS OF URBAN STORMWATER,
New South Wales Univ., Kensington. (Austrialia). School of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-08310

FACILITIES PLANNING SUMMARY, TITLE II, FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972.
Environmental Protection Agency, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 675, Price codes: A02 in paper copy, A01 in microfiche. January, 1974. 19 p, 4 fig.

Descriptors: *Planning, *Federal government, *Administrative agencies, *Waste water treatment, Facilities, Technology, Administration, Forcasting, Legislation, Programs, Future planning(Projected), Governmental interrelations, Federal Water Pollution Control Act, Water pollution, Waste water(Pollution), Comprehensive planning, Pollution abatement, Waste water disposal.

The Federal Water Pollution Control Act Amendments of 1972 affirmed the importance of planning, and contained new provisions to help achieve the importance of planning, and contained new provisions to help achieve the national objective of clean water. Thus summary describes the nature of the facilities planning process and the steps involved. The process basically involves stating and clarifying the problems, inventorying the existing systems, projecting future conditions, setting goals and objectives, developing alternatives to meet those goals, assessing the impacts of the alternatives to meet those goals, selecting plan elements, and developing implementation mechanisms. The objective of the 1972 Amendments is the application of the best practicable waste treatment technology, approached by treatment and discharge to receiving waters, treatment and reuse, and land application. If water quality standards cannot thus be met, additional measures providing for further pollutant reduction may be needed. Those include advanced waste treatment, temporary storage of treated effluent, and facilities include a problem statement, description of the proposed treatment works, and description of the complete waste water management system. (Molloy-Florida)
W78-08314

DETERMINATION OF KINETICS OF PHOSPHORUS MINERALIZATION IN SOILS UNDER OXIDIZING CONDITIONS,
Kansas State Univ., Manhattan. Dept. of Agronomy.
Y. V. Subbarao, and R. Ellis, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 594, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/2-77-180, August 1977. 63 p, 8 fig, 5 tab, 24 ref, 5 append. 1BC611, R803936.

Descriptors: *Phosphorus, *Kinetics, *Orthophosphates, *Soils, *Mineralization, *Sewage disposal, *Soil chemistry, Waste water disposal, Nutrients, Nutrient flux, Soil contamination, Sewage treatment, Eutrophication, Acid soils, Alkaline soils, Hydrogen ion concentration.

Reactions from adding orthophosphates to nine soils with widely different physical and chemical properties were studied to develop a better method of predicting phosphorus movement in soils used for sewage disposal. Conclusions: (1) Amorphous aluminum hydroxide or crystalline gibbsite controlled Al(+3) solubility in acid soils. (2) Soils with higher clay content fixed more phosphorus, while acid soils generally had more phosphorus fixation capacity than alkaline soils. (3) Monocalcium phosphate monohydrate in acid soils were transformed to compounds having higher solubility than variscite, which with time changed to crystalline variscite. (4) Several calcium compounds controlled phosphorus solubility when calcium orthophosphate, mono-(prim.) was added to neutral and alkaline soils. (5) Phosphorus applied at rates similar to those found near a fertilizer granule site saturated the soil zone with calcium orthophosphate, di-(sec.) and CaHPO4 in acid as well as alkaline soils. Intermediary compounds converted to crystalline variscite relatively rapidly at low phosphorus rates. Sandy soils should be avoided as waste disposal sites, due to the likelihood of high phosphorus movement, and hydroxyapatite should be present in alkaline soils to minimize phosphorus movement. (Lynch-Wisconsin)
W78-08378

FERTILIZER AND PESTICIDE MOVEMENT FROM CITRUS GROVES IN FLORIDA FLATWOOD SOILS,
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
R. S. Mansell, D. V. Calvert, E. H. Stewart, W. B. Wheeler, and J. S. Rogers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 889, Price codes: A08 in paper copy, A01 in microfiche. Report EPA-700/2-77-177, August 1977. 133 p, 73 fig, 35 tab, 53 ref, 1 append. 1HB617, R800517.

Descriptors: *Soils, *Fertilizers, *Pesticides, *Citrus fruits, *Drainage, *Agricultural runoff, *Irrigation, *Water pollution sources, Runoff, Florida, Nutrients, Nutrient flux, Agriculture, Nonpoint pollution, 2,4-D, Terbacil, Herbicides, Chlorobenzilate acaricide, Phosphates, Nitrates.

Fertilizer and pesticide effects on water quality were measured for three test plots of citrus trees at Fort Pierce, Florida under different soil management treatments. The primary soil type was Oldsmar sand, a member of the sandy siliceous, hyperthermic family of Alfic Arsenic Haplaquods (Spodosol). Treatments included: (1) shallow-tilled to 15-cm depth (ST), (2) deep-tilled through mixing the top 105 cm with a trenching machine (DT), and (3) deep-tilled to 105 cm with 56 metric tons/ha dolomitic limestone mixed with the soil (DTL). Concentrations and discharge amounts of nitrate-nitrogen, phosphate-phosphorus, the herbicides 2,4-D and terbacil, and chlorobenzilate acaricide were determined in surface and subsurface drainage waters. Water flux from subsurface plastic drains spaced 18.3 m apart at a depth of 107 cm, as well as drawdown of the water table at the midplane between drains, was consistently greater from shallow-tilled than from deep-tilled plots following a storm or irrigation; drainage from DT was more rapid than from DTL. Average annual losses of nitrate-nitrogen in surface and subsurface drainage was 22.1% from ST, 3.1% from DT, and 5.4% from DTL plots of total nitrogen applied as fertilizer. The corresponding figures for phosphate-phosphorus were 16.9%, 3.6%, and 3.5%. Loss of nutrients in surface runoff was very low for all three plots. Deep tillage likewise decreased leaching losses of terbacil and 2,4-D, although magnitudes were smaller. (Lynch-Wisconsin)
W78-08379

TRANSFORMATIONS OF HEAVY METALS AND PLANT NUTRIENTS IN DREDGED SEDIMENTS AS AFFECTED BY OXIDATION REDUCTION POTENTIAL AND PH, VOLUME I: LITERATURE REVIEW,
Louisiana Agricultural Experiment Station, Baton Rouge.
For primary bibliographic entry see Field 5C.
W78-08381

MINNESOTA WATER QUALITY: A REPORT TO THE CONGRESS OF THE UNITED STATES BY THE STATE OF MINNESOTA PURSUANT TO SECTION 305(B) OF THE FEDERAL WATER POLLUTION CONTROL ACT,
Minnesota Pollution Control Agency, Roseville.
For primary bibliographic entry see Field 5G.
W78-08387

A POSSIBLE MODEL FOR THE SURFACE-INDUCED HYDROLYSIS OF ORGANO PHOSPHORUS PESTICIDES ON KAOLINITE CLAYS,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
For primary bibliographic entry see Field 2G.
W78-08391

SWIMMERS' ITCH IN NEW BRUNSWICK: DISTRIBUTION AND DESCRIPTION OF CAUSATIVE AGENT, CERCARIA CATASCOPII N.SP.,
New Brunswick Univ., Fredericton. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-08394

HEAVY METALS IN WASTE WATERS FROM THE CITY OF ZURICH (SCHWERMETALLE IN DEN ABWAESSERN DER STADT ZUERICH),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewasserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5A.
W78-08443

SOIL PERCOLATION TESTS IN THE LAGOS AREA,
Lagos Univ. (Nigeria).
T. M. Aluko.
Public Health Engineer, Vol. 5, No. 6, p 152-155, 1977. 4 fig, 3 tab, 11 ref.

Descriptors: *Soil types, *Percolation, *Return flow, *Sewage effluents, *Sewage disposal, Mathematical models, Analytical techniques, Laterites, Waste water treatment, Domestic wastes.

An empirical formula relating percolation rates with permitted rates of sewage effluent application was applied to percolation test results from six soil sites in Lagos, Nigeria. The sandy-laterite test sites had percolation rates which varied significantly over the three days of testing. Considerable rate differences were recorded for tests sites that were 1 m apart. The allowable sewage loading rates for the six sites as calculated by the empirical formula were less than the standard loading rates defined by Nigerian building codes. Results of the empirical formula would indicate that loading rates on soakaway pits used for domestic waste disposal were excessive. It was concluded that the empirical formula developed for calculating allowable sewage application rates was not valid for Nigerian soil types and therefore, not a universally applicable formula. (Lisk-FIRL)
W78-08464

RIVER WATER QUALITY IN ESSEX DURING AND AFTER THE 1976 DROUGHT,
Essex Water Co., (England).
J. G. Slack.
Effluent and Water Treatment Journal, Vol. 17, No. 11, p 575-578, November, 1977. 2 fig, 3 tab, 2 ref.

Descriptors: *Water quality, *Rivers, *Waste water disposal, *Droughts, *Nitrates, Environmental effects, Chloride, Denitrification, Low flows, River beds, Precipitation(Atmospheric), Waste assimilative capacity, Boron, Waste water treatment, Flow profiles, Municipal wastes.

The impact of a 1976 drought on the water quality of sewage receiving rivers in Essex, England, was analyzed. River flows in the River Stour in July averaged 2.64 mgd, nearly the total quantity of sewage discharged to the river; the River Chelmer averaged 4.98 mgd, half of which consisted of sewage effluent. Sewage effluent in the rivers was monitored with boron measurements, an element that is not found naturally in river water. The concentration of chloride, discharged into the Stour at the rate of 7,000-8,000 lbs/day, downriver from the outlet source was much lower than expected during the very dry summer months. Similarly, nitrate in the sewage effluent, averaging 20 mg/liter, was reduced to one-tenth the initial concentration in the downstream river water, indicating biological denitrification. Nitrate and chloride concentrations increased significantly in the fall when rainfall increased. It was concluded that chloride and other sewage effluent constituents accumulated in the river beds during low flow periods and were washed from the bed with the increasing volume of clean water from rainfall; biological denitrification also increased during the low flow periods. (Lisk-FIRL)
W78-08491

THE MOVEMENT OF SEWAGE EFFLUENT THROUGH SOIL COLUMNS: THE MAJOR IONS (NA, CA, MG, CL, AND SO4),
Saskatchewan Univ., Saskatoon. Dept. of Soil Science.
E. De Jong.
Journal of Environmental Quality, Vol. 7, No. 1, p 133-136, January-March, 1978. 5 fig, 4 tab, 13 ref.

Descriptors: *Leaching, *Soils, *Sodium, *Calcium, *Magnesium, Chloride, Sulfates, Sands, Clays, Adsorption, Trickling filters, Sewage, Waste water treatment, Municipal wastes.

Laboratory experiments investigated the leaching of sodium, calcium, magnesium, chloride, sulfate, and potassium contained in sewage effluent through soil columns. One liter of sewage effluent contained 236 mg sodium, 19.6 mg potassium, 87 mg calcium, 53 mg magnesium, 204 mg chloride, and 387 mg sulfate. The effluent was introduced into the columns packed with 3 horizons of Asquith loamy sand and 1 horizon of Oxbow clay as flood or trickle flow at 7, 13, and 18C under dark conditions. The passage of sodium, calcium, magnesium, chloride, and sulfate ions was not significantly altered by temperature, soil structure, or application. Breakthrough curves demonstrated more rapid passage of the anions through the columns than predicted. This behavior was attributed to incomplete mixing of the effluent and soil. The passage of sodium, calcium, and magnesium was affected by exchange reactions; sodium and calcium approached equilibrium after 3 pore volumes leached, much sooner than magnesium. Cation breakthrough curves were altered by incomplete mixing, initial exchangeable and soluble cation concentrations, and the sum of the exchangeable cations. (Lisk-FIRL)
W78-08492

SPRAY IRRIGATION OF DOMESTIC SEWAGE IN THE BRAUNSCHWEIG SEWAGE ASSOCIATION - ENVIRONMENTAL POLLUTION OR SUCCESSFUL UTILIZATION OF SEWAGE. (DIE VERREGNUNG VON KOMMUNALEM ABWAESSERN IM ABWASSERVERBAND BRAUNSCHWEIG - UMWELTVERSCHMUTZUNG ODER SINNVOLLE ABWASSERVERWERTUNG),
Kiel Univ. (West Germany). Inst. fuer Wasserwirtschaft und Meliorationswesen.

H. Baumann, and A. Braun.
Wasser und Boden, Vol. 30, No. 3, p 63-67, 1978. 8 fig, 4 tab, 10 ref.

Descriptors: *Return flow, *Groundwater, *Nitrates, *Sprinkler irrigation, *Waste water disposal, Environmental effects, Path of pollutants, Waste assimilative capacity, Nutrient removal, Water pollution control, Municipal wastes, Waste water treatment.

The Braunschweig Sewage Association in West Germany performed tests on a 4,000 ha plot of brown podsol agricultural land to determine the extent of groundwater contamination by spray irrigation with municipal waste water. Water and soil analyses were also used to define the waste assimilative capacity of the soil. Permanganate consumption and BOD values disclosed that almost no organic substances in the spray-irrigated effluent reached the groundwater. Soil water analyses following a single application of excessive quantities (5,400 mm/ha) of municipal sewage by spray irrigation revealed that although the groundwater was contaminated at the irrigation site, only elevated nitrate levels were apparent after 350 m of transport from the site. Repeated applications of effluent reduced the waste assimilative capacity of the soil, especially during winter months when vegetation was not extensive. Effluent applications did leach sodium, potassium, and nitrate ions from the large quantities of synthetic fertilizers which had been applied to the area. This phenomenon was considered an important consideration in assessing the nutrient levels provided by spray irrigation. (Kroha-FIRL)
W78-08493

THE APPLICATION OF A TIME-SERIES-ANALYSIS IN WATER QUALITY MANAGEMENT (ANWENDUNG EINER ZEITREIHENANALYSE IN DER WASSERGUETEWIRTSCHAFT),
Abteilung Siedlungswasserwirtschaft, Brunswick (West Germany) Inst. fuer Stadtbauwesen.
For primary bibliographic entry see Field 5G.
W78-08494

RESULTS OF POLLUTION CONTROL OF THE RHINE WATER IN RHINELAND-PALATINATE (ERFOLGE BEI DER REINHALTUNG DES RHEINS IN RHEINLAND-PFLAZ),
Landesamt fuer Gewasserkunde, Mainz (West Germany).
For primary bibliographic entry see Field 5G.
W78-08496

NEW PROSPECTS FOR SEWAGE DISPOSAL IN U P,
Irrigation Commission, Lucknow (India).
For primary bibliographic entry see Field 5E.
W78-08500

A SHORT TERM STUDY ON THE POLLUTION OF TAPTI RIVER IN SURAT REGION,
S. V. Regional Coll. of Engineering and Technology, Surat (India).
For primary bibliographic entry see Field 5A.
W78-08504

FATE AND EFFECTS OF CONTAMINANTS MARINE ECOSYSTEMS AND ORGANISMS,
National Oceanographic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
For primary bibliographic entry see Field 5C.
W78-08528

EFFECTS OF CHEMICAL USE IN OFFSHORE WELL-DRILLING OPERATIONS,
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 5C.
W78-08533

THE CHEMISTRY AND ECOLOGICAL EFFECTS OF CHLORINATION OF SEAWATER: A SUMMARY OF EPA RESEARCH PROJECTS,
Environmental Research Lab., Johns Island, SC. Bears Bluff Field Station; Miami Univ., FL. Div. of Chemical Oceanography.
For primary bibliographic entry see Field 5C.
W78-08534

POWER PLANT COOLING WATER CHLORINATION IN NORTHERN CALIFORNIA,
California Univ., Berkeley. Coll. of Engineering; and California Univ., Berkeley. School of Public Health.
S. Hergott, D. Jenkins, and J. F. Thomas.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 187-225, 34 fig, 22 ref.

Descriptors: *Chlorination, *Water pollution sources, *Water pollution effects, Powerplants, Toxicity, California, *Outer Continental Shelf, Ocean outfalls.

This study was conducted to determine the nature, levels, and persistence of chlorinated compounds in the discharges of five power plants in northern California. In-plant studies were conducted to understand the demands for chlorine in the cooling water system and to determine the levels reaching the receiving waters. Decay studies conducted at the outfalls, together with measurements of oxidant residuals in the receiving water, provide a base for estimating the persistence and zone of influence of the chlorinated compounds. It was determined that all effluents produced receiving water oxidant residual levels that would be predicted to demonstrate chronic toxicity to marine organisms; the receiving water from two plants (Hunters Point and Moss Landing) showed levels that would be predicted to demonstrate chronic toxicity to fresh water organisms. Acutely toxic levels to fresh water and marine organisms existed in the receiving waters at the Potrero site. (See also W78-08520) (Sinha - OEIS)
W78-08535

DEVELOPMENT OF OCEAN OIL SPILL CONCENTRATION AND TRAJECTORY FORECAST METHODS,
National Weather Service, Silver Spring, MD.
For primary bibliographic entry see Field 5C.
W78-08539

FLOW AGAINST DISPERSION IN NONADSORBING POROUS MEDIA,
California Univ., Davis. Dept. of Land, Air and Water Resources; and California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W78-08546

SEASONAL RUNOFF LOSSES OF NITROGEN AND PHOSPHORUS FROM MISSOURI VALLEY LOESS WATERSHEDS,
Agricultural Research Station, Lafayette, IN.
E. E. Alberts, G. E. Schuman, and R. E. Burwell.
Journal of Environmental Quality, Vol. 7, No. 2, p 203-208, April-June 1978. 6 tab, 21 ref.

Descriptors: *Phosphates, *Nitrogen, *Missouri, *Iowa, *Surface runoff, *Water quality, *Soil erosion, Fertilizers, Phosphorus compounds, Nutrient removal, Eutrophication, Water properties, Pollutants, Water pollution, Nitrogen compounds, Sediments, Agricultural runoff, Water pollution sources, *Nutrient loss, *Missouri Valley Loess Watersheds.

Seasonal losses of nitrogen and phosphorus in surface runoff were determined for a 7-year period from three corn-cropped watersheds in southwestern Iowa. Three seasonal periods were defined: fertilizer, seedbed, and establishment period from April through June (P1); reproduction and maturation period from July through November (P2); and residue period from December through March (P3). Most of the average annual total N and P losses were associated with the sediment portion of runoff and occurred during P1. The extreme susceptibility of the loess soils to erosion during P1 must be taken into account when designing conservation practices to control plants nutrient losses. Seasonal discharges of runoff, sediment, and nutrients were much lower from a level-terraced watershed than from two contour-farmed watersheds, which demonstrates the benefit of terracing in resource conservation. Average annual soluble N and P losses were quite low and never exceeded 1% of the annual fertilizer application. These losses were the highest during P3 from the contour-farmed watersheds. Water and sediment weighted nutrient concentrations were the highest from the contour-farmed watersheds during P3, when residues covered the soil surface. Leaching of soluble nutrients from the residue and the greater selectivity of the soil erosion process for the finer fractions of the soil (i.e., clay and organic material) during snowmelt runoff are probably the factors responsible. (Henley-ISWS)
W78-08550

STEADY STATE RIVER QUALITY MODELING BY SEQUENTIAL EXTENDED KALMAN FILTERS,
Utah Water Research Lab., Logan.
D. S. Bowles, and W. J. Grenney.
Water Resources Research, Vol. 14, No. 1, p 84-96, February 1978. 11 fig, 3 tab, 14 ref, 1 append.

Descriptors: *Water quality, *Utah, *Rivers, *Model studies, *Mathematical models, Pollutants, Water pollution, Biochemical oxygen demand, Nitrogen, Nitrogen compounds, Algae, Dissolved oxygen, Estimating equations, *Jordan River(Utah), Mathematical filters, Kalman filters.

Sequential extended Kalman filters (EKF) were applied as a technique for steady-state river water quality modeling. The approach was demonstrated by using water quality data collected over a 36.4-mi stretch of the Jordan River, Utah. Each EKF was used to represent a river reach in which hydraulic and quality characteristics were judged fairly uniform. Mean and variance boundary conditions between successive filters were adjusted to represent the effects of variance estimates of the system state (water quality parameters) and confidence intervals on these estimates were provided by combining two independent estimates of the system state. The independent estimates were based on (1) predictions from an 'internally meaningful' model of the stream transport processes and biochemical transformations, and (2) measurements of the water quality parameters. The estimates were combined by a weighting procedure based on uncertainties associated with each estimate. A smoothing algorithm also was applied in order that estimates from passes of the filter procedure in both the downstream and upstream directions could be combined. In this way, information contained in the measurements was used both upstream and downstream of the location of the measurement. The calibration capability of the filter procedure was demonstrated by simultaneous estimation of the state vector and one of the model coefficients. This capability also was used to estimate simultaneously the rate of lateral loading for one of the water quality parameters. Simultaneous estimation of coefficients of lateral loading was shown to increase the uncertainty associated with filter estimates because of the inclusion of uncertainty associated with these coefficients and lateral loading rates. (Sims-ISWS)
W78-08554

NITRATE, CHLORIDE AND DISSOLVED SOLIDS, OGALLALA AQUIFER, WEST TEXAS,
Texas Tech Univ., Lubbock. Dept. of Geosciences.
C. C. Reeves, Jr., and W. D. Miller.
Ground Water, Vol. 16, No. 3, p 167-173, May-June 1978. 8 fig, 1 tab, 7 ref.

Descriptors: *Nitrates, *Texas, *Chlorides, *Dissolved solids, Water distribution(Applied), Groundwater, Water quality, Distribution, Water supply, On-site investigations, *Ogallala aquifer(Texas), *Alkali lake basins, Saline cretaceous aquifers.

The distribution of nitrate, chloride ans dissolved solids from groundwater from the Ogallala aquifer in a 27-county area of west Texas illustrates widespread areas of poor water quality. Elements studied increased in concentration from northwest to southeast across the Southern High Plains. Northeast of a line from about Clovis, New Mexico, to Lubbock, Texas, nitrate tends to be less than 45 mg/l, chloride is less than 20 mg/l, and dissolved solids are less than 400 mg/l. However, southwest of this line, nitrate may exceed 60 mg/l and in some areas exceeds 170 mg/l. Chloride commonly exceeds 500 mg/l and may be more than 2000 mg/l, and dissolved solids usually exceed 1000 mg/l and may be more than 8000 mg/l. Regional distribution may be the result of long-term migration of Ogallala groundwater, but the present water quality and distribution, as well as time, distance, stratigraphy, and permeability, suggest contamination of Ogallala groundwater by vertical rather than lateral migration. Most of the high nitrate values (more than 45 mg/l) occur in areas having sandy soils which have been intensively cultivated, thus leaching of nitrogen-based fertilizers is suspect. However, the high chloride and dissolved solids, which exist in essentially the some geographic area, probably represent vertical to local lateral seepage of saline water from large alkali lake basins and local vertical migration from saline Cretaceous aquifers. (Lee-ISWS)
W78-08555

PREVENTION OF NITRATE LEAKAGE FROM THE HULA BASIN, ISRAEL: A CASE STUDY IN WATERSHED MANAGEMENT,
Technion-Israel Inst. of Tech., Haifa (Israel). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-08564

IMPACT OF ENERGY DEVELOPMENT ON GROUND WATER,
American Society of Civil Engineers, New York. Hydraulics Div.
R. E. Aten, R. M. Alverson, R. W. Brooks, E. M. Cushing, and R. D. Johnson.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 104, No HY2, Proceedings Paper 13554, p 157-168, February 1978. 3 fig, 4 tab, 4 ref.

Descriptors: *Energy development, *Environmental effects, *Groundwater, Hydrology, Research and development, Waste disposal, Coals, Oil, Oil shales, Nuclear energy, Energy consumption, Energy levels.

A Task Committee (TC) of the Ground-Water Hydrology Committee was organized in 1975 by the Hydraulics Division, ASCE, to evaluate the 'Impact of Energy Development on Ground Water Resources.' The TC considered development to include all phases of the energy-use cycle from exploration through waste disposal. The purpose of the TC was to assemble information on the broad range of energy-related groundwater problems; to recommend what should be done about these problems; and to indicate research requirements to help alleviate the problems. Activities are proceedings in three phases. The first phase, which is reported herein, is to determine the more significant areas of likely impacts; the second phase is to identify means to evaluate these impact areas in greater detail; and the third phase is to prepare a recommended action program. (Visocky-ISWS)
W78-08566

WASTEWATER DISPOSAL FROM TWO-DIMENSIONAL DIFFUSER,
Democritos Univ. of Thraki, Xanthi (Greece). School of Engineering.
For primary bibliographic entry see Field 5E.
W78-08567

APPLICATION OF THE UNIFIED TRANSPORT MODEL TO THE MOVEMENT OF PB, CD, ZN, CU, AND S THROUGH THE CROOKED CREEK WATERSHED,
Oak Ridge National Lab., TN.
J. K. Munro, Jr., R. J. Luxmore, E. L. Begovich, K. R. Dixon, and A. P. Watson.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL/NSF/EATC-28, Price codes: A05 in paper copy, A01 in microfiche. Report ORNL/NSF/EATC-28, Sept 1976. 89 p, 22 fig, 10 tab, 26 ref.

Descriptors: *Meters, *Lead, *Cadmium, *Zinc, *Copper, *Sulfur, Water table, Mine wastes, Mine waters, Mineral industry, Mine drainage, Mining, Headwaters, Heavy metals, Soil chemistry, Soils, Soil water movements, Methodology, *Missouri, *Unified transport model, *Crooked Creek Watershed(MO), Soil Chemical Exchange of Heavy Metals.

Two versions of the Unified Tansport Model (UTM) have been used to simulate movement of Pb, Cd, Zn, Cu, and S through the Crooked Creek Watershed, a 1.3 mi.2 forested headwaters area adjacent to a mine and smelter in southeast Missouri. The Wisconsin Hydrologic Transport Model (WHTM) version was used to study accumulation of heavy metals in the soil and to simulate stream flow and heavy metal concentrations in the stream draining the watershed. The Terrestrial Ecology and Hydrology Model (TEHM) version was used to study heavy metal and SO2 effects on the vegetation by considering plant uptake in a plant growth and decomposition model. The Soil Chemical Exchange of Heavy metals (SCEHM) submodel in TEHM was used in a detailed comparison between results from a six-year simulation of heavy metal accumulation in the top soil layers and measured values. Agreement between simulated results from both versions of the UTM and measured values is satisfactory. (EIS-Katz)
W78-08628

IMPACT OF NEARSTREAM VEGETATION AND STREAM MORPHOLOGTY ON WATER QUALITY AND STREAM BIOTA,
Illinois Univ. at Urbana-Champaign. Dept. of Ecology, Ethology and Evolution.
For primary bibliographic entry see Field 5G.
W78-08634

ENVIRONMENTAL PATHWAYS OF SELECTED CHEMICALS IN FRESHWATER SYSTEMS. PART I: BACKGROUND AND EXPERIMENTAL PROCEDURES,
Stanford Research Inst., Menlo Park, CA.
W. R. Mabey, N. Bohonos, B. R. Holt, J. H. Smith, and S. S. Lee.
Available from the National Technical Information Service, Springfield, VA 22161 PB-274 548, Price codes: A05 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA-600/7-77-113, October 1977. 81 p, 9 tab, 8 fig, 44 ref.

Descriptors: *Methodology, *Path of pollutants, *Water pollution effects, Absorption, Hydrolysis, Degradation(Decompositional), Model studies, *Environmental effects, Environmental control, Bacteria, Sediments, Water quality, Oxygen, Eutrophication, Laboratory tests, Laboratory techniques.

This research was initiated to develop environmental exposure assessment procedures that can be used to predict the pathways of potentially harmful chemicals in freshwater environments. The approach is based on three premises: (1) the overall rate of disappearance of a chemical from the aquatic environment is controlled only by the dominant transformation and transport processes, (2) these processes can be studied independently in the laboratory, and (3) the laboratory data can be extrapolated to the rates of volatlization, photolysis, oxidation, hydrolysis, and biotransformation as well as the sorption partition coefficient of natural sediments and on a mixture of four bacteria. Two models have been used to extrapolate the laboratory results to the environment. (EIS-Katz)
W78-08635

EFFECTS AND INTERACTIONS OF POLYCHLORINATED BIPHENYLS (PCB) WITH ESTUARINE MICROORGANISMS AND SHELLFISH,
Maryland Univ., College Park.
For primary bibliographic entry see Field 5C.
W78-08637

EFFECTS OF THERMAL DISCHARGES ON PHYSICO-CHEMICAL PROCESSES AND WATER QUALITY, VISTULA RIVER, POLAND,
Institute of Meteorology and Water Management, Warsaw (Poland).
For primary bibliographic entry see Field 5C.
W78-08639

CONSIDERATIONS RELATING TO TOXIC SUBSTANCES IN THE APPLICATION OF MUNICIPAL SLUDGE TO CROPLAND AND PASTURELAND (A BACKGROUND SUMMARY),
Environmental Protection Agency, Washington, DC. Office of Toxic Substances.
F. D. Kover.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 006, Price codes: A03 in paper copy, A01 in microfiche. Report EPA 560/8-76-004, Nov. 1976. 24 p, 4 tab, 65 ref.

Descriptors: *Heavy metals, *Polychlorinated biphenyls, *Cadmium, Trace elements, Path of pollutants, *Sludge, *Sludge disposal, Food chain, Toxicity, Municipal wastes, *Pastures, *Municipal sludge, *Sludge-amended soils, Sludge uptake, Cropland.

This report presents background information pertinent to an assessment of the potential health hazards from toxic substances when disposing/utilizing municipal sludge on agricultural lands, particularly croplands and pasturelands where products enter the human food chain. (EIS-Katz)
W78-08651

RECOMMENDATIONS OF THE EPA/NBS WORKSHOP ON THE NATIONAL ENVIRONMENTAL SPECIMEN BANK,
National Bureau of Standards, Washington, DC. Analytical Chemistry Div.
For primary bibliographic entry see Field 5A.
W78-08652

DISPERSION STUDY OF BURIED ELEMENTAL MERCURY,
Du Pont de Nemours (E. I.) and Co., Aiken, SC. Savannah River Lab.
For primary bibliographic entry see Field 5E.
W78-08655

MIGRATION OF EXPLOSIVES AND CHLORINATED PESTICIDES IN A SIMULATED SANITARY LANDFILL,
Construction Engineering Research Lab. (Army). Champaign, IL.
K. A. Conley, and W. J. Mikucki.
Available from the National Technical Information Service, Springfield, VA 22161, as AD-A030 453, Price codes: A03 in paper copy, A01 in microfiche. Construction Engineering Research Laboratory, Technical Report N-8, September 1976. 47 p, 9 tab, 13 fig, 20 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *DDT, *DDD, *DDE, Industrial wastes, Sanitary engineering, Landfills, Migration, Migration patterns, Methodology, *Leachate, *Leaching, Solid wastes, Soils, *Path of pollutants, *Explosives, Vertical migration, Horizontal migration, *TNT.

This report presents results of a series of tests to determine whether the hazardous substances of DDT and TNT will leach from or migrate through a simulated sanitary landfill. DDT and two of its degradation products, DDD and DDE, were not recovered from samples of the leachates tested. Analysis of soil core samples showed some vertical migration and very little horizontal migration. TNT analysis in leachates was accomplished by applying a sensitive method of analysis--pulse polarography. Fewer than five parts per billion of TNT were found in leachates from soil systems. TNT was detected in core samples from a soil/solid waste system, but not from a soil system. It is theorized that some channelization of flow occurred. (EIS-Katz)
W78-08656

UPTAKE OF ORGANIC SUBSTRATES BY CYCLOTELLA CRYPTICA (BACILLARIOPHYCEAE): EFFECTS OF IONS, IONOPHORES AND METABOLIC AND TRANSPORT INHIBITORS,
Toronto Univ. (Ontario). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-08659

HEAVY METALS IN MUSSELS (MYTILUS GALLOPROVINCIALIS) FROM THE GULF OF LA SPEZIA AND FROM THE PROMONTORY OF PORTOFINO, ITALY,
Genoa Univ. (Italy). Inst. of General and Inorganic Chemistry.
For primary bibliographic entry see Field 5C.
W78-08661

A STUDY ON THE MERCURY CONTENT IN MUSCLES OF THE FISH FAMILY CARANGIDAE FROM THE FISHING GROUNDS OFF THE COAST OF NORTH-WEST AFRICA,
Institute of Marine Food Technology, Szczecin (Poland).
For primary bibliographic entry see Field 5C.
W78-08662

AN EXPERIMENTAL APPROACH IN STUDYING THE INFLUENCE OF MERCURY ON A NORTH SEA COASTAL PLANKTON COMMUNITY,
Central Lab., TNO, Delft (Netherlands).
For primary bibliographic entry see Field 5C.
W78-08664

ACCUMULATION OF POLYCHLORINATED BIPHENYLS IN THE COCKLE CERASTODERMA EDULE AND THE TELLIN MACOMA BALTHICA,
London Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-08666

REACTION OF ESTUARINE ECOSYSTEMS TO EFFLUENT FROM PULP AND PAPER INDUSTRY,
Aberdeen Univ. (Scotland). Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-08667

SELECTIVE UPTAKE OF 55FE FROM SEAWATER BY ZOOPLANKTON,
Oregon Coll. of Education, Monmouth.
For primary bibliographic entry see Field 5C.
W78-08673

THE EFFECTS OF VEGETATION REMOVAL BY GRASS CARP ON WATER CHEMISTRY AND PHYTOPLANKTON IN INDIANA PONDS,
Purdue Univ., Lafayette, IN. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 5C.
W78-08681

TISSUE UPTAKE, SUBCELLULAR DISTRIBUTION, AND METABOLISM OF 14CH3HGCL AND CH3(203)HGCL BY RAINBOW TROUT, SALMO GAIRDNERI,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Physiology.
For primary bibliographic entry see Field 5C.
W78-08690

TOXICITY AND BIOACCUMULATION OF CADMIUM AND LEAD IN AQUATIC INVERTEBRATES,
Environmental Research Lab.-Duluth, MN.
For primary bibliographic entry see Field 5C.
W78-08695

FACTORS AFFECTING METHYL AND INORGANIC MERCURY DYNAMICS IN MUSSELS AND SHRIMP,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
For primary bibliographic entry see Field 5C.
W78-08699

DIMENSIONLESS SOLUTIONS OF BORDER-IRRIGATION ADVANCE,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 3F.
W78-08717

IRRIGATION WASTEWATER DISPOSAL WELL STUDIES-SNAKE PLAIN AQUIFER,
Idaho Dept. of Water Resources, Boise.
W. G. Graham, D. W. Clapp, and T. A. Putkey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 762, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/3-77-071, June, 1977. 51 p, 8 fig, 22 tab, 13 ref.

Descriptors: Runoff, *Idaho, Irrigation, Irrigation effects, *Aquifers, Water quality, Groundwater, Water pollution, Path of pollutants, *Waste disposal wells, *Waste water disposal, *Agricultural runoff, *Snake River Plain aquifer(Idaho).

Drain wells are used to dispose of excess irrigation and surface runoff water from approximately 320,000 acres of agricultural land within the eastern Snake River Plain area of southern Idaho. The impact of this practice on the underlying Snake River Plain aquifer, the primary source of potable water for approximately 140,000 people, was not understood. Thus, an investigation was initiated to evaluate the impact of irrigation disposal well practices on the water quality of the Snake Plain aquifer. (Skogerboe-Colorado State)
W78-08724

POLLUTANT CONTRIBUTIONS FROM IRRIGATION SURFACE RETURN FLOWS,
Max C. Fleischmann College of Agriculture, Reno, NV.
W. W. Miller, J. C. Guitjens, C. N. Mahannah, and H. M. Joung.
Journal of Environmental Quality, Vol 7, No 1, p 35-40, January-March 1978. 2 fig, 5 tab, 10 ref.

Descriptors: Water pollution effects, *Water quality control, Water quality, *Water pollution sources, Water supply, Irrigation water, Surface-groundwater relationships, *Nevada, *Return flow, Water chemistry, Oxidation, On-site investigations, Water sampling, *Flood irrigation.

Four study sites, located in the Carson River Basin, Nevada, containing approximately 500,000 acres irrigated by surface flooding, were selected for a 2 year investigation of causes and sources of irrigation surface return flow pollution and the interrelationships among pollution components. Irrigation applications and surface return flows were metered, net applied water was computed, and volume of infiltrated water was determined, based on water sampling and laboratory analysis of DO, BOD, TDS, NO3, -N, TN, PO4-P, and TP. Phosphate content was determined via the persulfate digestion method. Filterable orthophosphate was determined by the ascorbic acid method. Study conclusions suggest: (1) BOD, and to a less extent, P4-P, are identified as major pollutants; (2) significant decrease in DO is noted as water moves from head to tail; (3) diffuse subsurface return flows appear to be sources of certain pollutants for surface water; and (4) water quality differences may be attributed in part to changes in water quantities, suggesting the need for further investigation. (Jewkes-Arizona)
W78-08743

RELATIVE MOVEMENT OF BROMIDE AND NITRATE IN SOILS UNDER THREE IRRIGATION SYSTEMS,
Texas A and M Univ., Lubbock. Agricultural Research and Extension Center.
For primary bibliographic entry see Field 2G.
W78-08756

AN ECONOMIC EVALUATION OF CROPLAND USE AS A CONTROL FOR SEDIMENT NONPOINT POLLUTION,
Iowa Agriculture and Home Economics Experiment Station, Ames.
For primary bibliographic entry see Field 5G.
W78-08758

ROLE OF SEDIMENT IN THE PERSISTENCE OF ENTEROVIRUSES IN THE ESTUARINE ENVIRONMENT.
Baylor Coll of Medicine, Houston, TX. Dept. of Virology and Epidemiology.
For primary bibliographic entry see Field 5C.
W78-08781

THE RISE AND FALL OF MIREX,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W78-08782

AQUATIC ENVIRONMENTAL SAFETY ASSESSMENT FOR A NONPHOSPHATE DETERGENT BUILDER,
Proctor and Gamble Co., Cincinnati, OH. Environmental Safety Dept.
For primary bibliographic entry see Field 5C.
W78-08783

5C. Effects Of Pollution

CHEMICAL CONTROL OF BRUSH AND ENVIRONMENTAL SAFETY OF ROADSIDE VEGETATION MANAGEMENT CHEMICALS,
Purdue Univ., Lafayette, IN. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5G.
W78-08224

TRACE METALS IN THE ENVIRONMENT,
New York Univ., NY. Task Force for Research Planning in Environmental Health Sciences (2nd).
For primary bibliographic entry see Field 5B.
W78-08226

AN ANALYSIS OF EXPOSURE PANEL DATA COLLECTED AT MILLSTONE POINT, CONNECTICUT,
Massachusetts Inst. of Tech. Cambridge. Energy Lab.
R. T. Brown, and S. F. Moore.
Avaliable from the National Technical Information Service, Springfield, VA 22161 as PB-275 251, Price codes: A07 in paper copy, A01 in microfiche. Report No. MIT-EL 77-015, July 1977. 119 p, 17 fig, 13 tab, 24 ref, append.

Descriptors: Aquatic life, *Environmental effects, *Powerplants, *Cooling water, *Discharge(Water), *Thermal pollution, Water pollution effects, *Connecticut, Exposure panels, Boring aquatic organisms, Multivariate hypothesis, Cluster analysis, Factor analysis, Statistical power analysis.

Results of a comprehensive analysis of data collected as part of exposure panel (small pine boards backed by transite, submerged just below low tide level which are colonized and inhabited by a community of boring organisms) experiments at the Northeast Utility Service Company Millstone Power Station in Connecticut are reported. Study objectives were: (1) to identify, develop, and carry out alternative quantitative analyses of the exposure panel data which test hypotheses of ecological effects of the powerplant, and (2) to identify and propose changes in the present design of the experiment which can improve the information content and/or cost-effectiveness of the study. Analytical methods of determining community composition and abundance are detailed. The exposure panel experiment yields data relevant to testing hypotheses regarding environmental effects of power plant cooling water intake and discharge. The total number of species (S) occurring on 12-month exposure panels is an ecologically meaningful parameter which can be statistically analyzed but contains limited information on community composition. The probability of detecting changes of three species or more in S with the existing data is 0.9 or larger; detection periodicities can be detected in the number of species occurring on 12-month exposure panels; this effect accounts for about 20% of the observed variability at these sites. The sample of species occurring on any given panel consists of about 10 commonly occurring species plus 6-10 randomly occurring rare species. Recommendations include: replicate testing and analysis, reduction of maximum exposure time, and a complete cost effective analysis. (Seip-IPA)
W78-08231

THE MISSOURI LEAD STUDY: AN INTERDISCIPLINARY INVESTIGATION OF ENVIRONMENTAL POLLUTION BY LEAD AND OTHER HEAVY METALS FROM INDUSTRIAL DEVELOPMENT IN THE NEW LEAD BELT OF SOUTHEASTERN MISSOURI. VOLUME I,
Missouri Univ.-Rolla; and Missouri Univ.-Columbia.
For primary bibliographic entry see Field 5B.
W78-08243

A PRELIMINARY ASSESSMENT OF THE ENVIRONMENTAL IMPACTS FROM OIL SHALE DEVELOPMENTS,
TRW, Inc., Redondo Beach, CA. Environmental Engineering, Div.
K. W. Crawford, C. H. Prien, L. B. Baboolal, C. C. Shih, and A. A. Lee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 283, Price codes: A09 in paper copy, A01 in microfiche. Report No. EPA-600/7-77-069, July, 1977. 173 p, 25 fig, 39 tab, 158 ref. 68-02-1881.

Descriptors: *Oil shales, Environmental effects, Research priorities, Research and development, Technology, *Industrial wastes, Effluents, *Air pollution, Water pollution, *Water quality, *Solid wastes, Monitoring, *Water pollution sources, *Pollutant identification, Colorado, Utah, Oil shale extraction, Oil shale refining, Piceance Basin(CO), Yellow Creek Basin(CO), Unita Basin(UT).

A summary of the status of oil shale technologies and development activities and the nature and resources of pollution from oil shale development and their potential impacts on the physical environment is presented; research priorities are established. Included in the report are: (1) an introduction and summary of the Preliminary Environmental Assessment (PEA); (2) a brief review of oil shale extraction and retorting technologies, including the history, technology, development plans, and environmental programs of the major contenders for commercial development; (3) a review of the sources and nature of pollution from shale oil operations, including the pollutant inventories presented by the various developers for air, liquid, and solid waste emissions; (4) a description of the baseline environmental conditions and a discussion of the potential environmental impacts of the various technologies and developments; (5) a brief review of shale oil upgrading and refining experiences to date, and of waste streams and hazards associated with refining and handling of shale oil; and (6) a summary of monitoring projects and studies which have been or are being conducted in the Piceance and Unita Basins, and which are relevant to oil shale development. (Seip-IPA)
W78-08246

TRANSURANICS IN NATURAL ENVIRONMENTS.
Energy Research and Development Administration, Las Vegas.
For primary bibliographic entry see Field 5B.
W78-08248

TRANSURANIC SPECIATION IN THE ENVIRONMENT,
Oak Ridge National LAb., TN.
For primary bibliographic entry see Field 5B.
W78-08249

DISTRIBUTION PATTERNS AND TRANSPORT OF PLUTONIUM IN FRESHWATER ENVIRONMENTS WITH EMPHASIS ON PRIMARY PRODUCERS,
Oak Ridge National Lab., TN. Environmental Sciences Div.
For primary bibliographic entry see Field 5B.
W78-08250

PLUTONIUM-237: AN IMPORTANT RESEARCH TOOL FOR STUDIES OF ENVIRONMENTAL PLUTONIUM KINETICS,
Oak Ridge National Lab., TN. Environmental Sciences Div.
For primary bibliographic entry see Field 5B.
W78-08251

DISTRIBUTION OF PU-238 AND PU-239, 240 IN AQUATIC MACROPHYTES FROM A MIDWESTERN WATERSHED,
Argonne National Lab., IL. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 5B.
W78-08252

PU-238 AND PU-239, 240 DISTRIBUTION IN FISH AND INVERTEBRATES FROM THE GREAT MIAMI RIVER, OHIO,
Argonne National Lab., IL. Radiological and Environmental Research Div.
G. E. Bartelt, C. W. Wayman, S. E. Groves, and J. J. Alberts.
In: Transuranics in Natural Environments, The Nevada Applied Ecology Group Symposium on the Dynamics of Transuranics by Terrestrial and Aquatic Environments, October, 1976, Gatlinburg, TN, p. 517-529, June, 1977. 1 fig, 5 tab, 20 ref.

Descriptors: *Radioactivity effects, *Radioactive wastes, *Absorption, *Digestion, Water pollution effects, *Crayfish, *Carp, Freshwater fish, *Shellfish, Minnows, Shad, Goldfish, Clams, Aquatic life, Fish, Ohio, Plutonium, *Plutonium-238, *Plutonium-239, 240, *Great Miami River(OH), Radioactivity assimilation, Biological assimilation, Tissue analysis, Feeding, GAstrointestinal tract, Transuranics.

Samples of minnows, shad, goldfish, carp, crayfish, and clams were taken from the Great Miami River in the vicinity of Miamisburg, Ohio; activities of plutonium (Pu-238 an Pu-239, 240) are reported for these organisms. Distributions were determined for plutonium between the gastrointestinal tract and the remainder of the organisms in carp and between the shell and soft parts of crayfish. Fish collected below the effluent discharge pipe of Mound Laboratory show a substantial increase in Pu-238 activity, apparently independent of their feeding behavior. The activities in carp gastrointestinal tracts are much higher than in carp bodies, presumably due to sediment found in the gut. It appears that there is little transfer of plutionim across intestinal walls of carp into body tissues. Crayfish collected downstream of Mound Laboratory show elevated levels of Pu-238 particularly in soft tissues as opposed to shell. Activities of Pu-238 in crayfish tend to increase during an effluent pulse. A size-dependent relationship may exist in crayfish with larger size classes having lower activities per unit weight than smaller size classes, possibly due to the difference in relative surface area of the shell and gills. The results are discussed with regard to the spatial distribution of the organisms around Miamisburg and the tissue distribution within the animals. (See also W78-08248) (Seip-IPA)
W78-08253

EFFECT OF NATURALLY OCCURRING ORGANICS ON PLUTONIUM-237 UPTAKE BY ALGAE AND BACTERIA,
Savannah River Ecology Lab., Aiken, SC.
J. P. Giesy, Jr., D. Paine, and L. W. Hersloff.
In: Transuranics in Natural Environments., The Nevada Applied Ecology Group Symposium on the Dynamics of Transuranics by Terrestrial and Aquatic Environments, October, 1976, Gatlinburg, TN, p. 531-543, June, 1977. 4 tab, 43 ref.

Descriptors: *Radioactivity effects, *Organic compounds, *Scenedesmus, *Aquatic, *Algae, *Aquatic bacteria, *Absorption, Distribution,

Ponds, South Carolina, Pollutant identification, Plutonium, *Plutonium,237, *Aeromonas hydrophila, Total organic carbon, Radioactive uptake, Skinface Pond.

The effects of naturally occurring organics on plutonium-237 (Pu-237) uptake by two species of algae and bacteria (Secnedesmus obliquus and Aeromonas hydrophila) were investigated. Organics were concentrated from Skinface Pond, near Aiken, South Carolina, and separated by membrane ultrafiltration into four nominal diameter size fractions: FI greater than 0.0183; FII less than 0.0183, more than 0.0032; FIII less than 0.0032, greater than 0.0009; FIV less than 0.009 micrometers. Each fraction was introduced into S. obliquus and A. hydrophila cultures at concentrations equal to those found in nature to determine their effects on incubations. Initial plutonium concentration in each flask was 0.0011 micro Curie/ml Pu-237(4+) (NO3)4. Tota organic carbon (TOC) in the pond was 31.1 mg/l (approximately 4 times the world average for rivers and typical of southeastern aquatic systems). More than 80% TO was comprised of FIII and FIV. FI and FII significantly reduced uptake by S. obliquus; FIII, which contained 36% of the TOC, had no significant effect on uptake by S. obliquus, while FIV significantly increased it. A similar trend was observed for uptake by A. hydrophila; FI and FII reduced uptake below that in tryptic soy broth medium alone. No polymerization was observed in these experiments; less than 5% of the plutonium was lost by plating to glass flask, with plating losses less in flasks containing organics. (See also W78-08248) (Seip-IPA)
W78-08254

FOLLOW-UP STUDY OF THE DISTRIBUTION AND FATE OF POLYCHLORINATED BIPHENYLS AND BENZENES IN SOIL AND GROUNDWATER SAMPLES AFTER AN ACCIDENTAL SPILL OF TRANSFORMER FLUIDS,
Environmental Protection Agency, Atlanta, GA. Air and Hazardous Materials Div.
For primary bibliographic entry see Field 5B.
W78-08255

PHOSPHATE ADSORPTION-DESORPTION CHARACTERISTICS OF SUSPENDED SEDIMENTS IN THE MAUMEE RIVER BASIN OF OHIO,
Ohio Agricultural Research and Development Center, Wooster. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-08276

MODELING EFFECTS OF AQUATIC PLANTS IN RIVERS.
Ministry of Works and Development, Hamilton (New Zealand).
J. C. Rutherford.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. EE4, p 575-591, August 1977. 6 fig, 5 tab, 18 ref.

Descriptors: *Water quality, *Aquatic plants, *Dissolved oxygen, *Rivers, Effects, *Photosynthesis, *Respiration, Thermal powerplants, Prediction, Biomass, Measurement, Mathematical models, Equations, Systems analysis, Simulation analysis.

When oxygen levels in polluted rivers are modeled, the effects of aquatic plant respiration and photosynthesis are usually represented by a single term. Such a simple approach suffers the disadvantage that it does not permit the relative contributions of the different communities of plants to be separately assessed. A more flexible approach is described in which the effect of three important plant communities on the dissolved oxygen levels is represented by a separate term, each one being dependent on the measured or estimated biomass of that community. The calibration of such a model is described for the Waikato River, New Zealand, where the phytoplankton were shown to be the principal contributors to the oxygen production and consumption. The model is then used to predict the effects of the discharge of the cooling water from a proposed power station on the dissolved oxygen levels in the river. (Graf-Cornell)
W78-08300

PROJECTIONS OF PHOSPHORUS LEVELS IN WHITE LAKE,
Hydroscience, Inc., Westwood, NJ.
W-S. Lung, and R. P. Canale.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. EE4, p 663-676, August 1977. 7 fig, 3 tab, 15 ref, 3 append.

Descriptors: *Eutrophication, *Lake rehabilitation, *Simulation analysis, *Phosphorus, *Water quality control, *Mathematical models, Sewage, Diversion, Programs, Management, Evaluation, Sediments, Tributaries, Flow, *Michigan, Equations, Systems analysis, *White Lake(Mich).

A preliminary mathematical model of phosphorus was used to evaluate different lake rehabilitation schemes for improvement of water quality in White Lake, Michigan. Model calculations indicate that phosphorus loss to the sediments and phosphorus removal by the tributary flow are two key processes responsible for rapid system response under reduced phosphorus loading rates. The sediments had little effect on the initial recovery following load reduction but play an important role in determining the ultimate equilibrium concentrations of phosphorus. Rehabilitation schemes such as aeration and circulation result in additional improvement in water quality beyond that provided by the present sewage diversion project alone. Additional reduction of phosphorus concentrations could be achieved by control of nonpoint sources which constitute about 80% of the total input to the lake. (Graf-Cornell)
W78-08304

MATHEMATICAL METHODS TO EVALUATE ENTRAINMENT OF AQUATIC ORGANISMS BY POWER PLANTS,
National Power Plant Team, Ann Arbor, MI.
For primary bibliographic entry see Field 8I.
W78-08312

THE POTENTIAL EFFECTS OF CLEARING AND SNAGGING ON STREAM ECOSYSTEMS,
Kansas State Univ., Manhattan. Div. of Biology.
G. Richard Marzolf.
For sale by the Superintendent of Documents, U. S. GPO , Washington, D.C. 20402 and Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 177, Price codes: A03 in paper copy, A01 in microfiche. Fish and Wildlife Service, Col., MI., Office of Biological Services, National Stream Alteration Project, Rep. FWS/OBS 78/14, Jan 1978. 31 p, 4 fig, 1 tab, 112 ref.

Descriptors: Streams, *Stream improvement, *Channel improvement, Plankton, Fish, *Debris removal, *Vegetation canopy, *Clearing(Streams), *Snagging(Streams), Canopy, Habitats, Reviews, Organic matter.

Clearing and snagging, the removal of obstructions from streams to increase the channel's capacity to convey water, is conducted to drain floodplains for agriculture, to protect citizens from floods, or to maintain navigable waterways. This review examines the widely held contention that such stream alteration reduces fish populations and is otherwise detrimental to the use of stream ecosystems. It was prepared for use in assessing the ecological impact of clearing and snagging projects. Because of the lack of direct quantitative evidence about clearing and snagging effects, the mechanisms involved in producing the effects are discussed indirectly as potential effects. Recent concepts of stream ecosystem function relate the functions of different groups of stream organisms to organic matter synthesis and degradation in various sizes and types of streams. This review emphasizes the roles obstructions (typically removed by clearing and snagging) exert on these stream ecosystem functions. Recent literature allows one to identify potential effects of clearing and snagging on stream function. Some effects are obvious when viewed in this process-oriented context, while others are less clear. For example, an obvious potential effect of clearing and snagging would be to decrease the rate at which organic matter loads are degraded by the stream system. A less obvious potential effect would be the effects of clearing and snagging on the plankton in streams. The depression of fish populations by clearing and snagging potentially occurs in two ways: (1) through alteration of the nature and abundance of organisms utilized by fishes as food, and (2) by direct effects of fish behavior (territoriality) and reproduction (spawning areas). This review identifies some potential ecological impacts of clearing and snagging, but does not yield quantitative predictions of the impacts. Pertinent recent literature on stream ecosystem function is reviewed and has much application in impact assessment. Parameters which could be measured for quantitatively evaluating the ecological effects of specific clearing and snagging projects are described.
W78-08358

MANAGEMENT OF BOTTOM SEDIMENTS CONTAINING TOXIC SUBSTANCES: PROCEEDINGS OF THE SECOND U.S.-JAPAN EXPERTS' MEETING--OCTOBER 1976, TOKYO, JAPAN.
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5G.
W78-08359

A LOG OF THE VERDE THE 'TAMING' OF AN ARIZONA RIVER,
Northern Arizona Univ., Flagstaff. Center for Intergrated Studies.
J. W. Byrkit.
The Journal of Arizona History, Vol 19, No 1, p 31-54, Spring, 1978. 26 ref.

Descriptors: *Arizona, Dams, River basin development, Water supply, *Watershed management, Planning, River regulation, History, Water rights, Water resources development, Water utilization, Water pollution effects, Irrigation practices, Water management(Applied), *Deterioration, Water shortage, Environmental effects.

The history of human habitation of the Verde Valley in north central Arizona is summarized, suggesting that at least five civilizations have lived in the area and all left due to insufficient water resources. Since the 1860's Americans have exploited the Verde River's Water supply for ranching, farming, and additional water for southwest Arizona, particularly the Phoenix area. Verde river pollution, due to railroad construction along the river and the copper mining and smelting at Clarkdale, is described. Various irrigation projects, wildlife depletion in Verde Valley, the effects of overgrazing and the present day population is threatened by the continued expanded use of its watershed resources. Present day use of the Verde River's resources include hydroelectric power stations in Childs and Glen Canyons, a reservoir in Blue Ridge Lake, the Horseshoe and Bartlett dams. Although the proposed Orme Dam was eliminated from the Central Arizona Project in 1977, other alternative plans for the use of the Verde and Salt Rivers watersheds continue to endanger the existence of the Verde River. (Jewkes-Arizona)

W78-08373

WHO KILLED THE GILA,
Florida Univ., Gainesville.
H. F. Dobyns.
The Journal of Arizona History, Vol 19, No 1, p 17-30, Spring, 1978. 49 ref.

Descriptors: *Arizona, *New Mexico, *River basin development, *Deterioration, Erosion, History, Irrigation practices, Water utilization, Water resources development, Watershed management, Dams, Water supply, Environmental effects, Arid lands, Land management, Social aspects.

Research suggests the deterioration of the Gila River, located in New Mexico and Arizona, was begun in the late seventeenth century by the Spanish introduction of cattle and horses to the Northern Pima Indians, living in the arid Gila River watershed. Nineteeth century Anglo-Americans accelerated the Gila River's watershed erosion, motivated by economic gain. Significant destructive watershed practices are summarized and include: (1) Silver and gold mining, resulting in water pollution and land erosion; (2) Construction of irrigation canals and poorly constructed diversion dams resulting in bank erosion; (3) Fur trapping, exterminating the beaver population; (4) Indiscriminate timber cutting for wood and fuel, eliminating the trees as control of water runoff. Twentieth century construction of the Roosevelt Dam on the Salt River, and the Coolidge Dam on the Gila River, resulted in the loss of abundant fish, water fowl, gamebirds and game animals from the lower and middle Gila River and the lower Salt River. (Jewkes-Arizona)
W78-08375

COMPARISON OF THE PHOTOSYNTHETIC CHARACTERISTICS OF THREE SUBMERSED AQUATIC PLANTS,
Florida Univ., Gainesville. Dept. of Agronomy.
T. K. Van, W. T. Haller, and G. Bowes.
Plant Physiology, Vol. 58, No. 6, p 761-768, December 1976. 6 fig, 4 tab, 33 ref.

Descriptors: *Aquatic weeds, *Photosynthesis, *Eurasian water milfoil, *Coontail, *Hydrilla verticillata, *Florida, Submerged plants, Ceratophyllum demersum, Myriophyllum spicatum, Cabomba caroliniana, Carbon dioxide, Light, Enzymes, Carbon, Macrophytes, Oxygen.

The low light requirement of Hydrilla verticillata may help explain its competitive success over Ceratophyllum demersum (coontail) and Myriophyllum spicatum (Eurasian water milfoil) in certain Florida freshwaters. As photosynthetic mechanisms of submersed macrophytes are poorly known, this study was designed to compare those mechanisms in the three plants. Hydrilla and Ceratophyllum had carbon dioxide compensation points of 44 and 41 macroliters/liter, respectively, while the value for Myriophyllum was 19. Relatively high carbon dioxide compensation points under 1% O2 indicated that some dark respiration occurred in the light. Inhibition of photosynthesis by O2 was less than with terrestrial carbon-3 plants. Glycolate oxidase activity was 12.3-27.5 micromoles O2/mg chl/hr, compared with 78.4 for spinach. Light saturation of photosynthesis occurred at 600-700 microeinsteins/sq m/sec in each species grown under full sunlight. Hydrilla had the lowest light compensation point, and required the least irradiance to achieve the half-maximal photosynthetic rate. Field measurements in a Hydrilla mat indicated that in afternoon free carbon dioxide dropped to zero, and O2 rose to over 200% air saturation. Most photosynthetic activity occurred in morning when free carbon dioxide was highest and O2 and solar radiation lowest. Light- and carbon dioxide-saturated photosynthetic rates for the three plants were 50-60 micromoles °2/mg chl/hr at 30C. (Lynch-Wisconsin)
W78-08376

FORMAT FOR ACQUIRING RAPID DATA ANALYSIS CAPABILITIES OF STORED DATA: MANIPULATION OF NATIONAL EUTROPHICATION SURVEY WATER QUALITY DATA,
Environmental Monitoring and Support Lab., Las Vegas, NV. Monitoring Operations Div.
For primary bibliographic entry see Field 5A.
W78-08377

DETERMINATION OF KINETICS OF PHOSPHORUS MINERALIZATION IN SOILS UNDER OXIDIZING CONDITIONS,
Kansas State Univ., Manhattan. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-08378

FERTILIZER AND PESTICIDE MOVEMENT FROM CITRUS GROVES IN FLORIDA FLATWOOD SOILS,
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
For primary bibliographic entry see Field 5B.
W78-08379

ECOLOGIC STRESS IN A SUBTROPICAL COASTAL LAGOON: LAKE ST. LUCIA, ZULULAND,
California Univ., Los Angeles. Dept. of Geography.
A. R. Orme.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-026 815, Price codes: A02 in paper copy, A01 in microfiche. Geoscience and Man, Vol 12, June 20, 1975, p 9-22. 13 fig, 12 ref. Office of Naval Research N00014-69-A-0200-4035.

Descriptors: *Lake St Lucia(South Africa), *Ecosystems, *Ecology, *Lagoons, *Sedimentation, *Zululand, Subtropic, Coasts, Environmental effects, Erosion, Salinity, Water level fluctuations, Estuaries, Mfolozi Lagoon(South Africa), Republic of South Africa, Natal, Lakes, Aquatic life, Breeding.

Lake St. Lucia, the remnant of the largest coastal lagoon created by the protohistoric Flandrian transgression along the Zululand coast, South Africa, has undergone physical changes which pose a threat to the survival of the entire lagoonal ecosystem. Five thousand years of sedimentation, segmentation, and reed-swamp encroachment have caused the disappearance of adjacent Mfolozi lagoon and reduced Lake St. Lucia from 912 sq km to a shallow lagoon of 312 sq km. Originally 112 km long and over 40 m deep, the latter is now only 40 km long and less than two m deep. Present sedimentation rates are two-three times the mean rate for the past 5000 years, in part a response to increased erosion further inland. In addition, periodic low water levels and high salinities reflect diminished discharge from water sheds affected by erratic rainfall, irrigation, forestation, and drainage diversions. Frequent closure of the estuary by strong littoral drift of the coast's massive sand barriers inhibits free exchange of water and biota between the lagoon and the Indian Ocean. The threat to the entire ecosystem is especially critical because the lagoon contains the most southerly populations of several plants and animals characteristic of tropical Africa. Mangroves are locally near extinction, and many birds, fish, and other life forms have ceased to breed; salt-tolerant species are replacing freshwater aquatics. (Lynch-Wisconsin)
W78-08380

TRANSFORMATIONS OF HEAVY METALS AND PLANT NUTRIENTS IN DREDGED SEDIMENTS AS AFFECTED BY OXIDATION REDUCTION POTENTIAL AND PH, VOLUME I: LITERATURE REVIEW,
Louisiana Agricultural Experiment Station, Baton Rouge.
R. A. Khalid, R. P. Gambrell, M. G. Verloo, and W. H. Patrick, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-041 468, Price codes: A11 in paper copy, A01 in microfiche. Contract Report D-77-4, May 1977, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. 221 p, 3 fig, 4 tab, 414 ref. DMRP Work Unit No 1C05. DACW39-74-C-0076.

Descriptors: *Reviews, *Heavy metals, *Dredging, *Oxidation-reduction potential, *Hydrogen ion concentration, *Nutrients, Spoils, *Bibliographies, Poisons, Trace elements, Sediment-water interfaces, Lead, Cadmium, Mercury, Arsenic, Selenium, Iron, Nitrogen, Phosphorus, Sulfur.

A review of 414 previous studies on the occurrence and chemistry of selected trace metals and plant nutrients in sediment-water systems, with emphasis on pH and oxidation-reduction effects, concludes that changes in the physicochemical nature of sediments could enhance release of toxicants or biostimulants. The study was undertaken to assess effects of disposal of dredged materials; too few studies of actual operations have been conducted, however, to draw broad conclusions regarding effects on water quality. Toxicants and nutrients included were lead, cadmium, mercury, arsenic, selenium, copper, zinc, manganese, iron, nitrogen, phosphorus, and sulfur. Where dredging activities have resulted in minimal change in metal ion concentration, some regulating processes influenced by oxidation-reduction reactions are possibly activated as others are inactivated. Adsorption and release reactions in disturbed sediment-water systems are frequently not of the magnitude predicted from metal-ligan solubilities and thermodynamic considerations of simple aqueous systems; but it is apparent that pH and redox potential do influence the availability of metals and plant nutrients by affecting regulatory processes. The second volume of this two-part study contains reports on laboratory investigations of pH and oxidation-reduction effects in sediment-water systems at four locations. (Lynch-Wisconsin)
W78-08381

BACTERIOLOGICAL STUDIES OF THE MESOTROPHIC LAKE JASNE,
Nicolas Copernicus Univ. of Torun (Poland). Lab. of Microbiology.
W. Donderski, and E. Strzelczyk.
In: Acta Universitatis Nicolai Copernici, Limnological Papers, No 10, p 15-27, 1977. 5 fig, 2 tab, 30 ref.

Descriptors: *Lake Jasne(Poland), *Mesotrophy, *Bacteria, *Distribution, *Nutrient requirements, *Eutrophication, Lakes, Nutrients, Microbiology, Trophic level, Amino acids, Ammonia, Starches.

The distribution, nutritional requirements, and biochemical activity of bacteria in mesotrophic Lake Jasne, Poland, were studied from samples collected in April, July, and November 1973. Bacteria, most numerous in spring and autumn, were also greater in surface waters of the littoral than pelagic zones, possibly due to organic substances and bacteria washed in from the soil surrounding the lake and to aquatic vascular plants growing near shore which may provide food through excretion of organic substances. Bacteria were dominated by nonsporing rods (up to 93%). Amino acid-requiring bacteria or those which grow best in the presence of amino acids and vitamins were predominant among nutritional groupings of bacteria, and were most numerous in summer and autumn. In terms of biochemical activity, ammonifiers were most numerous, particularly in surface waters in summer and autumn. Starch-hydrolyzing bacteria accounted for up to 44% of the isolates studied. Sulfate-reducing bacteria made up 6-64% of all bacteria, with maximum development in summer at a depth of 10 m. Water

samples for the study were taken at five stations in the littoral zone and one in the pelagic zone. Lake Jasne is situated in the Ilawa Lakeland, has a surface area of 10.7 ha, a maximum depth of 20 m, and a mean depth of 8.1 m. Five biochemical tests were made with bacterial isolates. (Lynch-Wisconsin)
W78-08382

PRIMARY PRODUCTION OF THE PLANKTON IN LAKE JEZIORAK,
Nicolas Copernicus Univ. of Torun (Poland). Inst. of Biology.
B. Bogaczewicz-Adamczak.
In: Acta Universitas Nicolai Copernici, Limnological Papers, No 10, p 29-39, 1977. 3 fig, 2 tab, 12 ref.

Descriptors: *Phytoplankton, *Lake Jeziorak(Poland), *Eutrophication, *Primary productivity, *Photosynthesis, Lakes, Algae, Trophic level, Biomass, Osmosis, Species composition.

A 1972 investigation relating primary production to species composition/biomass of phytoplankton in eutrophic Lake Jeziorak, Poland, concluded: (1) production amounts depend on the biological/physiological character of the phytoplankton; (2) diatoms are highest in photosynthesis; (3) cyanophytes increase biomass through osmotrophy as well as photosynthesis; (4) comparison with other years indicates 1972 was a year of low productivity; (5) allochthonous organic substances play an important part in Lake Jeziorak. Phytoplankton samples for primary production observations were collected at one station at the lake's maximum depth (11 m). Water temperature, transparency, and light penetration were so measured. In the study, 104 algal taxa were identified as Cyanophyta (19), Euglenophyta (6), Pyrrophyta (4), Chrysophyta (30), and Chlorophyta (45). Jeziorak phytoplankton composition is characterized by a few species which are abundant and occur frequently, and a larger group of species which contribute little to total biomass. Cyanophytes dominate throughout the growing season and reach maximum development in summer. During spring circulation algal biomass is uniformly distributed; in summer phytoplankton concentrate near the surface, with maximum concentration at a depth of 1-3 m. At the end of the growing season there is a steady turnover of phytoplankton in the entire water column. (Lynch-Wisconsin)
W78-08383

INTRODUCTORY INVESTIGATIONS ON THE STRATIFICATION OF THE UNDERGROUND ORGANS OF MACROPHYTES IN LAKE JEZIORAK,
Nicholas Copernicus Univ. of Torun (Poland). Dept. of Systematics and Plants Geography.
M. Rejewski.
In: Acta Universitatis Nicolai Copernici, Limnological Papers, No 10, p 59-88, 1977. 2 fig, 10 tab, 27 ref.

Descriptors: *Lake Jeziorak(Poland), *Macrophytes, *Roots, *Rhizomes, *Benthic flora, *Eutrophication, Lakes, Distribution, Aquatic plants, Phragmites communis, Scolochloa festucacea, Heleocharis palustris, Glyceria aquatica, Scoenoplectus lacustris, Helophytes, Littoral.

A study of the vertical distribution of roots and rhizomes of five aquatic macrophytes in the bottom of eutrophic Lake Jeziorak, Poland, showed that 96.9% of rhizomes and 82.8% of roots (as dry weight) were concentrated in the 15-cm surface layer. These macrophytes make up an estimated 88% of the total biomass of helophytes in the littoral zone of the lake. Phragmites communis, Heleocharis palustris, and Scolochloa festucacea show remarkably shallow root penetration, the bulk of the roots reaching less than 5 cm into the bottom. At 15 cm only a small percentage of root biomass is found: S. festucacea 6.1%, H. palustris 6.6%, and P. communis 6.9%. Roots of a second group, which includes Glyceria aquatica and Schoenoplectus lacustris, reach far deeper, with 20% of the root biomass of G. aquatica and 25.9% of S. lacustris below 15 cm. Over 90% of the total rhizome biomass of H. palustris and S. lacustris is concentrated in the top 5 cm, with virtually none below 15 cm. Further research is needed to measure physical factors (wave action, bottom structure, shore-bank morphology) which influence littoral distribution of plants whose rhizomes translocate to basin bottoms. Additionally, research is needed into the apparent ability of helophytes to utilize circulating mineral compounds to a far greater degree than previously assumed. (Lynch-Wisconsin)
W78-08384

THE PRODUCTION OF PERIPHYTONIC ALGAE IN LAKE TYNWALD,
Nicolas Copernicus Univ. of Torun (Poland). Inst. of Biology.
A. Oleksowicz.
In: Acta Universitatis Nicolai Copernici, Limnological Papers, No 10, p 41-51, 1977. 4 tab, 20 ref.

Descriptors: *Lake Tynwald(Poland), *Algae, *Periphyton, *Primary productivity, Species composition, Organic matter, Biomass, Lakes, Oedogonium, Epithemia, Respiration, Chlorophyta, Bacillariophyceae, Cyanophyta, Nutrients.

In an investigation of the structure, biomass, and primary production of periphytic algae in Lake Tynwald, Poland, some 250 species of periphytic algae were identified, a small number compared with other periphytic communities. Periphyton are important in animal feeding cycles. Great variation in biomass and primary production was found from 1973 to 1974; biomass was 24 kcal/sq m in 1973 and 0.933 kcal/sq m in 1974, and primary production was 2342.2 kcal/sq m/200 days in 1973 and 43.79 kcal/sq m/200 days in 1974. Despite this variability an Oedogonio-Epithemietum litoralae community exists in the lake. Low production and biomass in 1974 was due to insufficient development of the community. Maximum primary production obscrved was 52.21 kcal/sq m/day in August 1973; the minimum was 0.534 kcal/sq m/day in November 1972. The respiration rates in 1972 and 1974 were almost identical (in the range 0-482-1.74 kcal/sq m/day), but in 1973 respiration was 17.46 kcal/sq m/day. Microscopic glass plates attached to a wooden frame and submerged in the lake at a depth of about 40 cm (half the length of the submerged part of the reed stems) were used to collect the periphyton specimens. Most abundant groups were Chlorophyta, Bacillariophyceae, and Cyanophyta. Located among fields, meadows, and farm buildings of Tynwald village, the lake is enriched with nutrients through rainfall and inflow of subsurface waters. (Lynch-Wisconsin)
W78-08385

DISTRIBUTION, PRODUCTION AND DYNAMICS OF DEVELOPMENT OF THE HELEOCHARIS PALUSTRIS (L.) ROEM. ET SCHULT. IN THE JEZIORAK LAKE,
Nicholas Copernicus Univ. of Torun (Poland). Dept. of Systematics and Plant Geography.
M. Rejewski.
In: Acta Universitatis Nicolai Copernici, Limnological Papers, No 10, p 89-106, 1977. 8 fig, 4 tab, 16 ref.

Descriptors: *Heleocharis palustris, *Lake Jeziorak(Poland), *Eutrophication, *Waves(Water), *Distribution patterns, *Primary productivity, Lakes, Aquatic plants, Ecology, Seasonal, Stems, Roots, Rhizomes, Biomass, Littoral, Helophytes, Bottom sediments.

Resistence of Heleocharis palustris to wave action helps it successfully compete with other helophytes in areas of Lake Jeziorak, Poland, that are permanently subjected to waves, and correspondingly encourages location of the plant in such areas. Human intervention in lake management further enlarges the territory occupied by this species. The strongly eutrophic lake, one of the largest in the country with an area of 32.3 sq km, is a polymictic basin with low transparency (0.9-2.0 m) and slight alkalinity (pH 7.5-8.5 during the growing season). Yearly production of stems and subterranean parts of H. palustris was 7.3 tons/ha dry mass (24.3 million kcal/ha). Single-species patches of H. palustris occupy a total area of 19,324 sq m, with a mean area of the patches of 205.6 sq m, and a mean water depth of 38.6 cm. H. palustris grows on hard, gravely-sandy bottoms, with a preponderance of middle and fine sands (mean 40.7 and 35.7%), at a slight inclination (average 2-3 degrees). Statistically positive correlation was found between biomass and fine sand and dust content of the bottom. Single-species patches amount to a biomass of 11,275 kg/ha; stems account for 2365 kg/ha and underground parts 9360 kg/ha. Stem ash content is relatively low; during the growing season it amounts to an average of 9.5%, with a higher percentage in new stems (12%). Ash content of roots is about 50% of dry mass during the growing season. (Lynch-Wisconsin)
W78-08386

EFFECTS OF DREDGING ON AQUATIC ORGANISMS--WITH SPECIAL APPLICATION TO AREAS ADJACENT TO THE NORTHEASTERN PACIFIC OCEAN,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
G. R. Snyder.
Marine Fisheries Review, Vol 38, No 11, p 34-38, November 1976. 2 fig, 2 tab, 17 ref.

Descriptors: *Dredging, *Pacific Ocean, *Pacific Northwest US, *Spoils, *Environmental effects, *Aquatic life, *Ultimate disposal, *Eutrophication, Oceans, Rivers, Estuaries, Hydraulic equipment, Equipment, Hopper dredging, Pipeline dredging, Turbidity, Sediments, Toxins, Heavy metals, Nutrients, Primary productivity.

The effects of dredging and spoils on aquatic organisms is discussed in relation to operations in the U.S. Pacific Northwest. Sediment removal causes mechanical effects, turbidity, effects on larval development and settlement, and may produce lethal hydrogen sulfide levels. Gutterhead dredging has the most serious consequences, destroying vegetation and removing organisms. Hydraulic dredging uproots all vegetation, which may take a year to recolonize. Clamshell dredging leaves depressions in the substrate having DO and hydrogen sulfide levels inadequate for fish or benthic invertebrates. Turbidity and sediment load affect primary energy production. Effects of material disposal include: (1) loss of organisms through incompatibility of dredging and disposal sites; (2) burial of organisms; (3) turbidity; (4) anoxia; and (5) toxic chemical release. Such fixed epifauna as oysters perish when covered by sediment, though some benthic invertebrates can survive burial under up to 1 m of material. High turbidity can cause death to organisms from suffocation, can disrupt primary productivity and community structure, and can increase oxygen demand. No far-reaching effects of deposition of off-shore sediments as beach fill have been reported. Release of nutrients and toxic materials appear to accompany resuspension of bottom materials. (Lynch-Wisconsin)
W78-08388

SWIMMERS' ITCH IN NEW BRUNSWICK: DISTRIBUTION AND DESCRIPTION OF CAUSATIVE AGENT, CERCARIA CATASCOPII N.SP.,
New Brunswick Univ., Fredericton. Dept. of Biology.
M. E. Scott, and M. D. B. Burt.
Canadian Journal of Zoology, Vol 54, No 12, p 2200-2207, December 1976. 2 fig, 3 tab, 41 ref. National Research Council of Canada A2358.

Descriptors: *Swimmers' itch, *Schistosome dermatitis, *New brunswick(Canada), *Lakes, *Cercaria catascopii, *Human diseases, *Water pollution effects, *Swimming, Lymnaea catascopium catascopium, Physa gyrina, Canada, Worms, Snails, Gastropods, Recreation, Magaguadavic Lake(New Brunswick-Canada), Lake Utopia(New Brunswick-Canada), Chamcook Lake(New Brunswick-Canada).

The cause of swimmers' itch (schistosome dermatitis) in recreational lakes in New Brunswick, Canada, was found to be a new species of trematode worm, Cercaria catascopii, whose snail hosts are Lymnaea catascopium catascopium and Physa gyrina. Seven snail species were collected during the summers of 1974-76 in 18 lakes. Of 2016 specimens collected, 220 (10.9%) were infected with larval Digenea. Schistosome cercariae were found in L. catascopium and P. gyrina in Magaguadavic Lake, Lake Utopia, and Chamcook Lake. Three natural cases of schistosome dermatitis were observed during the study, all from Magaguadavic Lake, and one was reported from French Lake. P. gyrina has not previously been reported east of Ontario. Cercariae from P. gyrina could not be differentiated from those from L. catascopium on morphometric grounds, but in view of the usual strict host specificity of schistosomes, identification of these cercariae as belonging to the same species must remain tentative. The present material does not agree sufficiently well with any known Cercaria spp. to warrant identification with any one. The prevalence of swimmers' itch in New Brunswick appears greater than is apparent from the literature. This paper includes morphological description and a table of schistosome furcocercariae from freshwater snails in North America. (Lynch-Wisconsin)
W78-08394

PRIMARY PRODUCTION IN A LOUISIANA GULF COAST SPARTINA ALTERNIFLORA MARSH,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 2I.
W78-08404

ORGANOCHLORINE PESTICIDE AND POLYCHLORINATED BIPHENYL RESIDUES IN SELECTED FAUNA FROM A NEW JERSEY SALT MARSH---1967 VS. 1973,
Iowa Cooperative Wildlife Research Unit, Ames.
For primary bibliographic entry see Field 5G.
W78-08411

STREAM CHANNELIZATION IMPACTS ON SONGBIRDS AND SMALL MAMMALS IN VERMONT,
Massachusetts Univ., Amherst. Ddpt. of Forestry and Wildlife Management.
For primary bibliographic entry see Field 5G.
W78-08412

ANIMAL DISEASE HAZARDS OF SLUDGE DISPOSAL TO LAND: OCCURRENCE OF PATHOGENIC ORGANISMS,
Northumbrian Water Authority, Gosforth (England).
V. A. Argent, J. C. Bell, and M. Emslie-Smith.
Water Pollution Control, Vol. 76, p 511-516, 1977. 5 tab, 31 ref.

Descriptors: *Pathogenic bacteria, *Sewage sludge, *Salmonella, *Worms, *Sludge digestion, Return flow, Sludge disposal, Mycobacterium, Nematodes, Sewage bacteria, Waste water treatment, Municipal wastes.

Laboratory studies investigated the presence of worm eggs, salmonella, and Mycobacterium tuberculosis in raw, primary digested, and secondary digested sludge which was to be applied to land. The raw sludge was anaerobically digested at about 32C for 37 days. The sludge underwent secondary digestion for 33 days before it was applied to land. Sludge samples were obtained at each point in sludge processing. No trematode, nematode, or cestode ova were detected in 20 raw sludge samples, 33 primary digested sludge samples, or 33 secondary digested sludge samples. Raw sludge obtained from 28 small treatment plants did not contain worm eggs. Mycobacterium tuberculosis was undetected in 10 digested sludge samples, although non-pathogenic Mycobacterium terrae was identified. Out of 33 samples of secondary digested sludge to be applied to land, 22 samples were positive for salmonella with 9 serotypes identified. Four serotypes of salmonella were detected in 6 of 9 raw sludge samples and 12 out of 13 mixed samples contained 13 serotypes. Samples of raw sludge from the 28 small treatment plants showed 9 instances of salmonella as evidenced by 7 serotypes. The quantity of salmonella in raw sludge was less than 105/100 cu cm; the number of salmonella found in digested sludge ranged from 10-161/100 cu cm. (Lisk-FIRL)
W78-08463

INFECTIOUS DISEASE HAZARDS OF LAND-SPREADING SEWAGE WASTES,
Agricultural Research Service, Beltsville, MD. Biological Waste Management and Soil Nitrogen Lab.; and Agricultural Research Service, Beltsville, MD. Agricultural Environmental Quality Inst.
W. D. Burge, and P. B. Marsh.
Journal of Environmental Quality, Vol. 7, No. 1, p 1-9, January-March, 1978. 3 tab.

Descriptors: *Sludge disposal, *Return flow, *Sewage bacteria, *Viruses, *Diseases, Disinfection, Chlorination, Sprinkler irrigation, Domestic wastes, Waste water treatment, Waste water disposal, Municipal wastes.

Human diseases associated with land application of sludge, pathogen movement, pathogen viability, and disinfection are discussed in a literature review. Common infectious pathogens found in sewage include bacteria, protozoa, helminthic parasites, and viruses. Outbreaks of the diseases associated with forms of these pathogens have been directly traced to irrigation practices of sewage sludge, domestic wastes, and treated waste water disposal. Contamination of water supplies and consumption of raw vegetables and shellfish grown in the presence of sewage are the major means of transfer of sewage-related diseases to humans. Effects of sewage-borne pathogens on irrigation and treatment plant operators have been negligible. Percolation of waste water through certain soil types can remove amoeba cysts, helminth ova, and some bacteria and viruses; surface runoff of waste water poses a potential hazard. Heat drying, liming, composting, irradiation, and pasteurization have been found to be more effective than chlorination in pathogen removal. Pathogen-bearing aerosols from sprinkler irrigation of waste water can be reduced by modification of irrigation equipment and by establishing of a buffer zone of trees and shrubs. (Lisk-FIRL)
W78-08490

THE APPLICATION OF A TIME-SERIES-ANALYSIS IN WATER QUALITY MANAGEMENT (ANWENDUNG EINER ZEITREIHENANALYSE IN DER WASSERGUETEWIRTSCHAFT),
Abteilung Siedlungswasserwirtschaft, Brunswick (West Germany) Inst. fuer Stadtbauwesen.
For primary bibliographic entry see Field 5G.
W78-08494

CHLORINATION: ASSESSING ITS IMPACT,
C. Winklehaus.
Journal Water Pollution Control Federation, Vol. 49, No. 12, p 2354-2357, December, 1977.

Descriptors: *Chlorination, *Disinfection, *Sewage bacteria, *Ozone, *Environmental effects, Public health, Enteric bacteria, Waste water disposal, Sewage treatment, Toxicity, Potable water, Industrial wastes, Organic compounds, Coliforms, Epidemiology, Waste water treatment, Municipal wastes.

The 'Second Conference on Water Chlorination: Environmental and Health Effects' was held in Gatlinburg, Tennessee, during November 1977 under the sponsorship of the Oak Ridge National Laboratory, the U.S. Environmental Protection Agency, and the U.S. Department of Energy. Topics covered by the 65 papers presented during the conference included: freshwater systems, marine systems, toxicity, trihalomethanes, waste water disinfection, industrial wastes, health effects, alternatives, and legislation. An EPA overview of the regulatory aspects of chlorination cited as responsible for the reduction in the increased use of chlorine. EPA officials favored improving water and waste water treatment processes used prior to disinfection as a means of reducing the disinfectant doses required to achieve adequate pathogen control. EPA-sponsored projects on alternatives to chlorine, such as ozone and bromine chloride, were highlighted during a separate session. Papers on the health-related aspects of chlorination focused on the carciongenicity and mutagenicity of chlorinated waters as evidenced by epidemiological studies. (Lisk-FIRL)
W78-08498

FINAL ENVIRONMENTAL IMPACT STATEMENT--CITY OF JACKSONVILLE, FLORIDA WASTEWATER MANAGEMENT FACILITIES, ARLINGTON-EAST SERVICE DISTRICT.
Environmental Protection Agency, Atlanta, GA. Region IV.
For primary bibliographic entry see Field 5D.
W78-08506

THE EFFECT OF TEMPERATURE ON THE GROWTH OF ACINETOBACTER CALCOACETICUS,
Orange Free State Univ., Bloemfontein (South Africa). Dept. of Microbiology.
For primary bibliographic entry see Field 5D.
W78-08509

PROGRAM REVIEW PROCEEDINGS OF: ENVIRONMENTAL EFFECTS OF ENERGY RELATED ACTIVITIES ON MARINE/ESTUARINE ECOSYSTEMS.
Environmental Protection Agency, Washington, D.C. Office of Energy, Minerals, and Industry; and Environmental Protection Agency, Washington, D.C. Office of Research Development.
Report EPA-600/7-77-111, (OEMI-77-025), October 1977, 304 p. Compiled by Clinton Hall and Walter Preston.

Descriptors: *Water pollution effects, *Environmental effects, *Energy, *Ecosystems, *Estuarine environment, Pollutant identification, Monitoring, Path of pollutants, Ecology.

The Report of the Interagency Working Group on Health and Environmental Effects of Energy Use, completed in November 1974, recommended an integrated environmental sciences research pro-

gram addressing needs in five major areas: Pollutant Characterization and Monitoring; Environmental Transport Processes; Health Effects; Ecological Effects; and Entegrated Assessment. This compilation represents the proceedings from the review session for the marine and estuarine portion of the Interagency Energy-Environment Research and Development Program--cross-cutting the pollutant characterization and monitoring, environmental transport processes, and ecological effects subareas. (See W78-08521 thru W78-08541).
W78-08520

SUBLETHAL EFFECTS OF PETROLEUM ON MACOMA BALTHICA,
Alaska Univ., College. Inst. of Marine Science.
M. S. Stekoll, L. E. Clement, and D. G. Shaw.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 1-17, 5 fig, 3 append.

Descriptors: *Environmental effects, *Water pollution effects, *Clams, *Oil pollution, *Bioindicators, Intertidal areas, *Alaska, Pollutant identification, *Outer Continental Shelf, Petroleum, Sublethal effects, *Macoma balthica.

The bivalve mollusc Macoma balthica has previously been proposed as an indicator of oil pollution. This small clam was selected for study because of its wide distribution and abundance in Alaskan intertidal environments. Macoma balthical is a surface deposit feeder and suspension feeder, which would make it likely to concentrate both suspended and stranded oil that might occur following a spill. Such concentrated oil in the clams might be further distributed throughout the ecosystem via migrating birds that feed on M. balthica. It was the purpose of this investigation to show that M. balthica. is able to concentrate oil from an oil-sea water dispersion and to ascertain what effects the oil might have on membrane-bound enzymes and other physical and chemical parameters of the clams. (See also W78-08520) (Sinha - OEIS)
W78-08521

THE BENTHIC COMMUNITY OF A NATURAL OIL SEEP IN THE SANTA BARBARA CHANNEL,
California Univ., Livermore. Lawrence Livermore Lab.
R. B. Spies, P. H. Davis, and T. M. Distler.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-025, October 1977. p. 19-34, 9 fig, 23 ref.

Descriptors: *Oil pollution, *Benthos, *Water pollution effects, Seepage, *California, *Outer Continental Shelf, Natural seepages, Chronic pollution, *Santa Barbara Channel(CA)

Little information is available on the effects of petroleum hydrocarbons on soft bottom benthic communities. Since spills occur unpredictably and are ephemeral in behavior, the systematic study of their effects is extremely difficult. Sources of chronic hydrocarbon pollution should provide a more stable setting for studying such effects. If the best estimates of input rates of petroleum hydrocarbons to the marine environment are examined, it can be seen that chronic sources exceed accidental sources. The profuse offshare oil seeps of the Santa Barbara Channel provide an excellent natural laboratory for such a study. The abundance of bacteria in association with the active seepage suggests that petroleum hydrocarbons are being utilized as an extra carbon source. Measurements and experiments are needed to clarify the effects and fate of petroleum hydrocarbons in the benthic community. (See also W78-08520) (Sinha - OEIS)
W78-08522

ACUTE AND CHRONIC STUDIES WITH WATERFOWL EXPOSED TO PETROLEUM HYDROCARBONS,
Fish and Wildlife Service, Laurel, MD. Patuxent Wildlife Research Center.
M. P. Dieter.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 35-43, 6 fig, 4 ref.

Descriptors: *Water birds, *Water pollution effects, *Oil pollution, *Food chains, *Maryland, *Outer Continental Shelf, Aves.

The research program at Patuxent has been evaluating the biological effects of petroleum hydrocarbons on all stages of the waterfowl life cycle. These studies include: (1) the hatchability of eggs exposed to oils; (2) the development of ducklings fed oil from the day of hatch; and (3) reproduction in adult water fowl fed oil. The third study is complemented by another where adult waterfowl were fed a chemically defined mixture representative of the concentration and type of aromatic compounds present in oil. In addition, experiments have been initiated to evaluate biological responses to petroleum hydrocarbons incorporated via the food chain. Analytical development is proceedings in concert with all of these biological studies. (See also W78-08520) (Sinha-OEIS)
W78-08523

ACCUMULATION AND BIOLOGICAL EFFECTS OF COPPER AND CADMIUM ON MARINE SHELLFISH,
National Marine Fisheries Service, Beaufort, NC, Beaufort Lab.; and National Inst. of Environmental Health Sciences, Research Triangle Park, NC.
D. W. Engel, and B. A. Fowler.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 45-56, 8 fig, 12 ref.

Descriptors: *Water pollution effects, *Metals, *Copper, *Cadmium, Shellfish, Estuaries, *Outer Continental Shelf.

To approximate acute pollution situations, shellfish are being labeled with metals (copper and cadmium) over extended periods of time, and the labeled meat will be used in the production of a 'toxic' rat diet that represents more nearly a natural situation. The data presented in this report, along with corollary information currently being generated in the laboratory, indicate that the chemical species of an element determines its pharmacological and toxicological effects on aquatic organisms. The t oxicity of copper to algae and fish eggs and larvae was shown to be related to the 'free' cupric ion, and that the complexation of copper is by organic chelators and the degree of complexation is pH dependent. Cadmium, on the other hand, is complexed by chloride, an inorganic ligand, and the degree of complexation is independent of pH and the dissolved organic load in the water. Thus, it seems reasonable to continue research on the effects of metals, copper, cadmium, and arsenic, using well-defined chemical systems. Through the use of defined chemical systems it may be possible to demonstrate the mechanisms of action of metallic pollutants on marine and estuarine shellfish. (See also W78-08520) (Sinha - OEIS)
W78-08524

ECOLOGICAL CHARACTERIZATION: AN AID TO DECISION MAKING,
Fish and Wildlife Service, Bay Saint Louis, MS. Office of Biological Services.
H. D. Tait.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 57-64, 2 fig.

Descriptors: *Baseline studies, *Environmental effects, *Water pollution effects, Coasts, Beaches, *Outer Continental Shelf, Gulf Coast.

Ecosystem studies by the U.S. Fish and Wildlife Service (FWS) and funded through the 'EPA energy program' are now operational in four major coastal areas: Chenier Plain area of southeast Texas and southwest Louisiana, Pacific Northwest, Sea Island-Carolinian, and Maine. In this report, the rationale behind these studies, the progress to date, and the work projected for 1977 are reviewed. Unless policy decisions reflect ecological reality, the nearshore and onshore areas will receive the brunt of the ecological impacts of expanding energy programs. This is true, whether it be outer continental shelf (OCS) oil and gas development, tidal power, power plants, superports for supertankers, or geopressure energy extraction. The direct impact and the indirect effects must be considered. Some of the decisions and needs for information associated with the OCS oil and gas program are considered. (See also W78-08520) (Sinha-OEIS)
W78-08525

AN ECOLOGICAL CHARACTERIZATION OF THE CHENIER PLAIN OF SOUTHWESTERN LOUISIANA AND SOUTHEASTERN TEXAS: OBJECTIVES AND METHODOLOGIES,
Energy Resources Co., Inc., Cambridge, MA.
For primary bibliographic entry see Field 2L.
W78-08526

FATE AND EFFECTS OF CONTAMINANTS MARINE ECOSYSTEMS AND ORGANISMS,
National Oceanographic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
D. A. Wolfe.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 93-106, 11 ref.

Descriptors: *Water pollution effects, *Ecosystems, *Biota, *Resources development, *Baseline studies, Oil pollution, Polychlorinated byphenyl, Metals, Sediments, Fish, *Outer Continental Shelf, Petroleum.

The general objectives of the National Oceanographic and Atmospheric Administration's energy resources project on fate and effects are to identify and conduct laboratory and field research studies that will facilitate the assessment of potential environmental impacts from petroleum releases in coastal marine ecosystems. This effort does not have a site-specific orientation, however it is expected that the results of the process-oriented studies will have broad applicability to environmental problems in widely separated geographic areas. The efforts of this project on fate and effects were oriented mainly toward establishment of suitable in-house analytical support capability for NOAA's overall environmental program and the planning for future studies on fate and effects. In addition, laboratory studies were undertaken on the interactive effects of petroleum and polychlorinated biphenyl (PCB) exposure in fish and on the interactions of petroleum and metals in seawater-sediment systems. (See also W78-08520) (Sinha-OEIS)
W78-08528

LABORATORY AND FIELD STUDIES ON THE LONG-TERM EFFECTS OF PETROLEUM

HYDROCARBONS ON BENTHIC MARINE INVERTEBRATES,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Labs.
J. W. Anderson, R. Riley, and R. M. Bean.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p. 107-132, 11 fig, 15 ref.

Descriptors: *Benthos, *Oil pollution, *Sediments, *Water pollution effects, Invertebrates, Alaska, Washington, *Outer Continental Shelf, Petroleum hydrocarbons, Depuration.

As a result of oil production from the Alaskan outer continental shelf, the Pacific Northwest is one of the areas of the United States most likely to receive increased inputs of petroleum hydrocarbons (PHC) from transport, port operations, and refining. To define more clearly the potential for petroleum to exert significant long-term environmental effects in marine sediments, studies on the fate of crude oil in sediments are being conducted. This paper presents data on the uptake of numerous PHCs by three species present in contaminated sediment held for a long period (40 days) in the natural environment. The final aspect of this research concerns the natural rates of hydrocarbon depuration from oiled sediment and the effects of these compounds on the recruitment of benthic invertebrates. (See also W78-08520) (Sinha - OEIS)
W78-08529

ENVIRONMENTAL ASSESSMENT OF NORTHERN PUGET SOUND AND THE STRAIT OF JUAN DE FUCA,
National Oceanographic and Atmospheric Administration, Seattle, WA.
H. Harris.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 133-142, 1 fig.

Descriptors: *Resources development, *Water pollution effects, *Baseline studies, *Environmental effects, Oil pollution, *Washington, *Outer Continental Shelf, Petroleum development, *Puget Sound, *Strait of Juan de Fuca.

The environmental assessment of Northern Puget Sound and the Strait of Juan de Fuca is a 5-year study that addresses the potential marine environmental and ecological consequences of the intensified petroleum activities anticipated for the next decade. The biological program has focused initially on three communities particularly susceptible to damage from floating oil: the intertidal biota, the nearshore fishes, and the plankton. Since the Puget Sound ecosystem has not been subjected to exposure to massive amounts of petroleum, concentrations of hydrocarbons are presumed to be very low. Baseline levels will be determined throughout the region. The oceanographic program began in February-April 1976 with the deployment of current meter arrays in the Strait of Juan de Fuca near Port Angeles and wind recorders at strategic locations throughout the region. Data from this deployment have been processed, and analysis is underway. In another study, the seasonal and spatial occurrence of suspended solids is being determined as well as their sorptive characteristics relative to selected petroleum constituents. The principal vehicle for dissemination of information will be a series of interpretive monographs on various aspects of the Puget Sound ecosystem/environment. (See also W78-08520) (Sinha - OEIS)
W78-08530

ENVIRONMENTAL ASSESSMENT OF AN OFFSHORE OIL FIELD: A PROGRESS REPORT,
National Marine Fisheries Service, Galveston, TX. Southeast Fisheries Center.
R. J. Berry, and E. D. McRae.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 143-152, 3 fig.

Descriptors: *Baseline studies, *Environmental effects, *Oil pollution, *Ecosystems, *Resources development, *Texas, Shrimp, Fishing, Recreation, *Buccaneer Oil Fieid(Tex), *Outer Continental Shelf, Petroleum development, Environmental assessment, *Gulf of Mexico.

The area selected for study is the Buccaneer Oil Field located about 53 km (32 miles) south of Galveston. This field was chosen because it is isolated from other production areas and has been in operation long enough to allow development of climax communities. Situated in commercial shrimping grounds, it is a focal point for recreational fishing and diving activities. Objectives of the study are to compare ecosystems in the vicinity of a producing field with those in nearby unaltered areas and to identify changes attributable to pollutants and the presence of structures. (See also W78-08520) (Sinha - OEIS)
W78-08531

A STANDARD PROGRAM FOR ENVIRONMENTAL IMPACT ASSESSMENT: PHASE I--ICHTHYOPLANKTON SAMPLING,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 6G.
W78-08532

EFFECTS OF CHEMICAL USE IN OFFSHORE WELL-DRILLING OPERATIONS,
Environmental Research Lab., Gulf Breeze, FL.
N. L. Richards.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 161-173, 10 fig, 6 ref.

Descriptors: *Water pollution sources, *Baseline studies, *Chemical wastes, *Resources development, Ecology, Pollutants, Water pollution effects, Fish, Invertebrates, *Outer Continental Shelf, Offshore drilling, Drilling muds.

Data on the effects of chemical use in offshore well-drilling operations are very limited. Policy decisions are currently based on static, 96-hr LC50 determinations, observations of divers, and theoretical models of pollutant dispersion. A limited research program on drilling-fluid constituents has been initiated at the Gulf Breeze Laboratory to provide a better data base as one component in the evaluation of the relative hazard of using alternative drilling mud constituents and to develop better laboratory methods for xenobiotic evaluation. Choices among the multitude of alternative chemicals available for well-drilling operations can be based on better toxicological information. Hard data on effects might also eliminate unjustified concern about effects of certain chemicals, which, in fact, may be safely used in well-drilling activities. (See also W78-08520) (Sinha - OEIS)
W78-08533

THE CHEMISTRY AND ECOLOGICAL EFFECTS OF CHLORINATION OF SEAWATER: A SUMMARY OF EPA RESEARCH PROJECTS,
Environmental Research Lab., Johns Island, SC. Bears Bluff Field Station; Miami Univ., FL. Div. of Chemical Oceanography.
W. P. Davis, D. P. Middaugh, and J. H. Carpenter.
In: 'Program Review 'Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 175-186, 29 ref.

Descriptors: *Waste disposal, *Water pollution effects, *Chlorination, *Environmental effects, Baseline studies, Sewage wastes, *Outer Continental Shelf, Ocean dumping.

The results of ongoing research projects on the effects of chlorination on marine ecosystems from 1975 are summarized. Studies reveal that both halogenated and nonhalogenated compounds are produced from chlorination of waters rich in organic compounds from natural productivity. Chlorination efor disinfection of effluents from muncipal treatment plants entering marine environments seems to be a need baesed on myth or fear of pathogens. It is far from certain that chlorination controls viral pathogens, and marine waters are rarely implicated in pathogenic transmission. Therefore, chlorination practices must be carefully examined on the basis of real need. (See also W78-08520) (Sinha - OEIS)
W78-08534

POWER PLANT COOLING WATER CHLORINATION IN NORTHERN CALIFORNIA,
California Univ., Berkeley. Coll. of Engineering; and California Univ., Berkeley. School of Public Health.
For primary bibliographic entry see Field 5B.
W78-08535

THE NBS PROGRAM FOR STANDARDS FOR TRACE ORGANIC ANALYSIS IN THE MARINE ENVIRONMENT,
National Bureau of Standards, Washington, D.C. Analytical Chemistry Div.
For primary bibliographic entry see Field 5A.
W78-08536

THE NBS PROGRAM FOR STANDARDS FOR TRACE INORGANIC ANALYSIS IN THE MARINE ENVIRONMENT,
National Bureau of Standards, Washington, D.C. Analytical Chemistry Div.
For primary bibliographic entry see Field 5A.
W78-08537

STANDARDIZATION AND INTERCALIBRATION TECHNIQUES FOR MARINE MONITORING,
National Ocean Survey, Rockville, MD. Test and Evaluation Lab.
For primary bibliographic entry see Field 5A.
W78-08538

DEVELOPMENT OF OCEAN OIL SPILL CONCENTRATION AND TRAJECTORY FORECAST METHODS,
National Weather Service, Silver Spring, MD.
C. S. Barrientos.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 271-282. 1 fig.

Descriptors: *Oil spills, *Oil pollution, *Forecasting, *Water quality control, Water pollution, Model studies, *Path of pollutants, *Outer Continental Shelf, Trajectory forecast, Oil transport

Although contingency plans to prevent damage by oil pollution have been devised, there is an urgent need to develop methods to forecast movements and the behavior of the pollutant. In the case of oil spills, viable methods are required to predict the

oil movement. The objective of this program is to develop a numerical model to predict the concentrations and trajectories of petroleum in the open ocean (not in bays or estuaries). Concentration will be forecast as a function of space and time. The proposed model will cover various kinds of sources, i.e., continuous point leakage, individual spill, or spill added to a general background level of known variable concentrations. The model will include wind, wave, and current forecasts on a small scale in time and space not ordinarily included in the present atmospheric weather forecast system. Forecasting techniques will be developed for these variables. Additionally, trajectory models will require as input oceanic variables, including depth, coastal geometry, and physical properties of the water. These oceanic variables will be used in the development. (See also W78-08520) (Sinha-OEIS)
W78-08539

THE UNDERWAY WATER SAMPLING SYSTEM,
National Ocean Survey, Rockville, MD. Engineering Development Lab.
For primary bibliographic entry see Field 5A.
W78-08540

SHIPBOARD ENVIRONMENTAL DATA ACQUISITION SYSTEM,
National Weather Service, Silver Spring, MD.
For primary bibliographic entry see Field 5A.
W78-08541

IMPACT OF ENERGY DEVELOPMENT ON GROUND WATER,
American Society of Civil Engineers, New York. Hydraulics Div.
For primary bibliographic entry see Field 5B.
W78-08566

APPLICATION OF THE UNIFIED TRANSPORT MODEL TO THE MOVEMENT OF PB, CD, ZN, CU, AND S THROUGH THE CROOKED CREEK WATERSHED,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5B.
W78-08628

TOXIC EFFECTS OF MILITARY WASTEWATER EFFLUENT,
Texas Tech Univ., Lubbock. Water Resources Center.
R. M. Sweazy, F. L. Rose, and C. L. Baugh.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A038 795, Price codes: A05 in paper copy, A01 in microfiche. Final Report WRC-77-1, February 1977. 71 p, 10 tab, 19 fig, 9 ref.

Descriptors: *Toxicity, *Salamanders, Animal physiology, Biochemistry, Sewage, *Water pollution effects, Sewage effluents, Sewage disposal, Path of pollutants, Oil pollution, Lakes, Playas, Texas, Playa Lakes, *Tumors, *Carcinogens, Polycyclic aromatic hydrocarbons, Ambystoma tigrinum, Diesel oil, Asphalt, Enzymes.

A population of tiger salamanders, Ambystoma tigrinum, inhabiting a playa lake receiving treated domestic sewage were found to have a high incidence of tumors. Research was aimed at determining the causative agent, of the tumors, determining the transmittability of the tumors and to determine if conventional water treatment unit operations, coagulation, and sedimentation, filtration and chlorination would reduce the tumor incidence. Although no specific tumorigenic agent was positively identified, there was evidence to suggest that polycyclic aromatic hydrocarbons were the tumorigenic agents. Sources of these compounds, diesel oil and asphalt, were known to have been applied to the playa lake. It was also determined that the conventional water treatment unit operations employed had no effect on tumor incidence. (Els-Katz)
W78-08629

REPRODUCTIVE STUDIES WITH DIISOPROPYLMETHLY-PHOSPHONATE IN RATS,
Army Armament Research and Development Command. Aberdeen Proving Ground, MD. Chemical Systems Lab.
J. F. Hardisty, R. J. Pellerin, R. K. Biskup, and J. H. Manthei.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A040 454, Price codes: A03 in paper copy, A01 in microfiche. Technical Report ARCSL-TR-77037, May 1977. 43 p, 3 tab, 6 fig, 9 ref, Appendices.

Descriptors: *Public health, Water quality, *Water pollution effects, *Water pollution sources, Water sources, Water supply, Bioassay, Mammals, *Organophosphorus compounds, Reproduction, Pathology, Laboratory animals, Water consumption, *Diisopropymethylphosphonate, Fertility index, Gestation, Lactation, Postnatal development.

A single-generation reproductive study in the rat was performed to evaluate the potential hazard of diisopropylmethylphosphonate (DIMP) when consumed orally with drinking water. One group of 20 females and 20 male rats received laboratory water and served as a control group. Two groups (of 20 female and 20 male rats each) received laboratory water containing 10 and 1000 ppm DIMP, respectively. The exposure period consisted of the entire reproductive cycle of the Fo parents. Both the Fo parents and the F1 offspring were evaluated for adverse effects. There were no statistically significant differences between data from the control group and the treatment groups. There was no evidence of adverse effects upon the reproductive cycle of the rat when exposed to 10 or 1000 ppm DIMP in the drinking water. (EIS-Katz)
W78-08630

ACUTE TOXICITY OF DIISOPROPYLMETHYL PHOSPHONATE AND DICYCLOPENTADIENE TO AQUATIC ORGANISMS,
E G and G Bionomics, Wareham, MA.
R. E. Bentley, G. A. Leblanc, T. A. Hollister, and B. H. Sleight, III.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 750, Price codes: A06 in paper copy, A01 in microfiche. Army Medical Research and Development Command, Washington, D.C., Contract No. DAMD-17-75-C-5073, Final Report, July 1976, 98 p, 46 tab.

Descriptors: *Bioassay, *Mortality, Toxicity, Laboratory tests, Freshwater fish, Minnows, Daphnia, *Organophosphorus compounds, Aquatic animals, Laboratory animals, Juvenile fish, Sunfish, Midges, Channel catfish, Rainbow trout, Algae, *Diisopropylmethyl Phosphonate, *Dicyclopentadiene, Fathead minnow, Bluegill, Sunfish.

The acute toxicity of diisopropylmethyl phosphonate (DIMP) and dicyclopentadiene (DCPD) was studied utilizing aquatic organisms representing several trophic levels in an aquatic ecosystem. DCPD was found to be approximately 10X more toxic than DIMP. The eggs and 7-day old fry of the fathead minnow were the life stages least susceptible to DCPD and DIMP, respectively. Increasing hardness and pH 8.0 appeared to decrease slightly the toxicity of DIMP while the toxicity of DCPD was not significantly altered by varying water quality parameters. (EIS-Katz)
W78-08631

USE OF EXPOSURE UNITS FOR ESTIMATING AQUATIC TOXICITY OF ORGANOPHOSPHATE PESTICIDES,
Environmental Research Lab.-Duluth, MN.
D. T. Allison.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 796, Price codes: A03 in paper copy, A01 in microfiche. Ecological Research Series, EPA-600/3-77-077, July 1977. 24 p, 6 tab.

Descriptors: *Methodology, *Pesticides, *Organophosphorus pesticides, Bioassay, *Toxicity, Mortality, Freshwater fish, Water pollution effects, *Diazonin, Statistical methods, Hydrolysis, Laboratory tests, Laboratory annals, *Exposure units, *Chronic toxicity, Flagfish, Jordanella floridae.

Environmental water concentrations of organophosphate pesticides can be expected to fluctuate widely due to use patterns and rapid hydrolysis. This study investigated some relationships of exposure concentrations, duration and periodicity to the chronic toxicity of diazinon to flagfish (Jordanella floridae). Effects were compared on the basis of 'exposure units' (exposure concentration x exposure duration). Treatments at equivalent exposure units caused similar overall effects on the test populations regardless of the life stages exposed or exposure duration per se. The hypothesis is proposed that exposure units could be used to estimate the environmental impact of fluctuating water concentrations of organophosphate pesticides over a wide range of concentration, duration and periodicity. (EIS-Katz)
W78-08632

TOXAPHENE: CHRONIC TOXICITY TO FATHEAD MINNOWS AND CHANNEL CATFISH,
Fish and Wildlife Service. Columbia, MO. Fish-Pesticide Research Lab.
F. L. Mayer, Jr., P. M. Mehrle, Jr., and W. P. Dwyer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 695, Price codes: A03 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA 600/3-77-069, June 1977. 38 p, 17 tab, 4 fig.

Descriptors: *Channel catfish, *Freshwater fish, *Toxicity, Bioassay, Minnows, Laboratory tests, Mortality, Reproduction, Pathology, Growth rate, *Chlorinated hydrocarbon pesticides, Pesticide toxicity, Pesticides, Water pollution effects, Fish eggs, Larvae, *Fathead minnow, Chronic effects, Continuous exposure, Toxaphene.

Fathead minnows (Pimephales promelas) and channel catfish (Ictalurus punctatus) were continuously exposed to several toxaphene concentrations (13-630 ng/l) in flow-through diluter systems for 8 to 10 months. Growth and backbone quality of adult fathead minnows were decreased at 97 and 173 ng/l exposures, but adult channel catfish were not affected by toxaphene. Effects on reproduction were observed only in channel catfish in the 630 ng/l concentration: the period from pairing to spawning was increased and the amount of gelatinous matrix surrounding the eggs was reduced. Survival of fathead minnows was not affected by toxaphene, but the no-effect concentration for fry growth and bone quality was below 54 and 97 ng/l, respectively. Channel catfish fry survival and growth were reduced in the 299 and 630 ng/l exposures, and bone quality was altered in concentrations as low as 72 ng/l. The maximum toxaphene accumulation from water to fish was 69,000 times in fathead minnows and 50,000 times in channel catfish. Toxaphene was excreted very slowly in both species. (EIS-Katz)
W78-08633

ENVIRONMENTAL PATHWAYS OF SELECTED CHEMICALS IN FRESHWATER SYSTEMS. PART I: BACKGROUND AND EXPERIMENTAL PROCEDURES,
Stanford Research Inst., Menlo Park, CA.
For primary bibliographic entry see Field 5B.
W78-08635

ENVIRONMENTAL REQUIREMENTS AND POLLUTIN TOLERANCE OF COMMON FRESHWATER CHIRONOMIDAE,
Florida Agricultural and Mechanical Univ., Tallahassee. Lab. of Aquatic Entomology.
W. M. Beck, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 105, Price codes: A12 in paper copy, A01 in microfiche. Environmental Protection Agency, Environmental Monitoring Series, Report EPA-600/4-77-024, April 1977. 260 p, 230 tab, 29 ref.

Descriptors: *Aquatic insects, *Aquatic environment, Aquatic animals, *Environment, Larvae, Salinity, Hydrogen ion concentration, Nutrients, Biochemical oxygen demand, Oxygen, Water temperature, Benthos, Turbidity, Review, *Environmental requirements, Pollution tolerance, *Freshwater chironomids, *Chironomidae, Specific habitat.

Data on the environmental requirements and pollution tolerance of 230 taxa of freshwater chironomids were compiled from 33 references. This compilation was prepared to assist biologists in evaluating data from macroinvertebrate samples collected for the assessment of water quality. The following parameters were considered: developmental stage, pH, salinity, nutrients, degradable dissolved organics, oxygen, temperature, Turbidity, current, general habitat, specific habitat, seasonal distribution. (EIS-Katz)
W78-08636

EFFECTS AND INTERACTIONS OF POLYCHLORINATED BIPHENYLS (PCB) WITH ESTUARINE MICROORGANISMS AND SHELLFISH,
Maryland Univ., College Park.
R. R. Colwell, and G. S. Sayler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 103, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA-600/3-77-070. 45 p, 17 tab, 6 fig, 40 ref. June 1977.

Descriptors: *Aroclor, *Polychlorinated biphenyl, Marine microorganisms, *Marine bacteria, *Water pollution effects, Path of pollutants, Oysters, *Chesapeake Bay, Estuarine environment, Estuaries, Public health, Commercial shellfish, *Biodegradation, *PCB-resistant bacteria, Shellfish, Depuration, PCB contamination.

The role of estuarine bacteria in the mobilization, transport, and removal of polychlorinated biphenyls (PCB) was investigated in estuarine environments. A main objective of this investigation was to determine a secondary impact of PCB contamination of estuarine systems. The specific secondary effect was the PCB-stress-induced accumulation and depuration of enteric bacteria by shellfish, i.e., the Chesapeake Bay oyster, Crassostrea virginica. For this report, bacteria uninhibited by PCB, but capable of growth in the presence of PCB, are defined as PCB-resistant. In this regard, PCB-resistant bacteria were found to be distributed ubiquitously throughout estuarine and marine environments sampled in this study. The residence time of PCB in estuarine and marine environments is concluded to be sufficiently long to induce stress upon estuarine animals. (EIS-Katz)
W78-08637

EFFECTS ON TEMPERATURE ON HATCHING SUCCESS AND SURVIVAL OF LARVAE IN THE WHITE BASS,
Environmental Research Lab.-Duluth, MN.
J. H. McCormick.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 098, Price codes: A02 in paper copy, A01 in microfiche. Ecological Research Series, Report EPA-600/3-77-075, June 1977. 12 p, 2 tab, 19 ref.

Descriptors: *Water temperature, *Bioassay, Laboratory tests, Methodology, *Mortality, Fish eggs, *Fish reproduction, Bass, *White bass, Water pollution effects, *Thermal stress, *Thermal pollution, Thermal power, Larvae, Fish physiology, Embryonic growth stages.

To determine temperature effects of hatching of white bass (Morone chrysops) embryos, sample lots of fertilized eggs were exposed to 10 constant temperatures, 6 through 30C. Embryos exposed before gastrulation were more sensitive to extreme temperatures than those exposed after closure of the blastophore. The percentage of normal larvae hatched from embryos exposed before gastrulation was not significantly impaired over the temperature ranged 18-26C (P greater than 0.05). When first exposed after blastophore closure the range of temperatures allowing unimpaired hatching was extended to 14-26C (P greater than 0.05). Normal larvae hatched at 14-28C from embryos exposed before gastrulation and at 10-28C when exposed after blastop closure, but at the extremes in significantly reduced numbers (P less than 0.05). Hatching took place 4.5 days after fertilization when incubation at 14C and 1 day after fertilization at 26C. (EIS-Katz)
W78-08638

EFFECTS OF THERMAL DISCHARGES ON PHYSICO-CHEMICAL PROCESSES AND WATER QUALITY, VISTULA RIVER, POLAND,
Institute of Meteorology and Water Management, Warsaw (Poland).
J. Dojlida.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 804, Price codes: A09 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA-600/3-77-074a, June 1977. 161 p, 42 tab, 40 fig, 41 ref.

Descriptors: *Water temperature, *Thermal power plants, *Thermal pollution, Thermal water, *Thermal stress, Effluents, Water quality, On-site investigations, Thermal stratification, Dissolved oxygen, Nitrites, Sediments, *Vistula River, Poland, *Koezienice Power Plant(Poland), Thermal regime, Thermal plume, Field investigation.

A study on the influence of thermal water discharge from the Koezienice power plant on thermal regimes and water quality of the Vistula River was carried out between January 1973 and December 1975. Results of field survey of the thermal plume indicate that under non-extreme conditions of low flow and full capacity operation (1) the maximum stretch influence of heated water was 50 km and (2) theoretical models for estimation of average temperature of cross-sections downstreams are adequate. The influence of thermal water discharge on water quality was small and shown manly by decrease in dissolved oxygen and increase in nitrite concentration. Data are presented on effects on biochemical processes and size distribution of fine suspended sediments. Formula are developed to determine permissible river to temperature to meet dissolved oxygen criteria. (EIS-Katz)
W78-08639

EFFECTS OF MANGANESE AND THEIR MODIFICATION BY HEXAMETAPHOSPHATE,
Environmental Protection Agency, Cincinatti, OH.
R. J. Bull.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 264, Price codes: A03 in paper copy, A01 in microfiche. Environmental Health Effects Research Series, Report EPA 600/1-77-024, May 1977. 20 p, 2 tab, 5 fig, 23 ref.

Descriptors: *Manganese, *Public health, *Toxicity, Laboratory studies, Laboratory tests, Laboratory animals, *Potable water, *Water quality, Water pollution, Water pollution effects, Pathology, Biochemistry, *Dopamine, *Sodium hexametaphosphate, Corpus striata, Parkinson's disease.

The ability of oral Mn++ to produce the depletions of dopamine in corpus striata characteristic of the Parkinson-like syndrome in manganese workers was examined in rats. Mn++ failed to affect dopamine levels at concentrations of up to 2000 mg/liter of drinking water and six months of continuous exposure. A second objective of this work was to study the biological interactions between Mn++ and sodium hexametaphosphate ((NaPO3)6) administered simultaneously in drinking water. Some evidence was obtained that high concentrations of (NaPO3)6 depleted tissue Mn++ and produced decreased body weight gains over the experimental period. Similarly, Mn++ in high concentrations resulted in decreased growth of weanling animals. Stoichiometric combinations of Mn++ and ((NaPO3)6) prevented the decreased rate of growth produced by either agent alone. On the basis of these results, we conclude that Mn++ in drinking water presents little hazard in terms of central nervous system involvement in a homogeneous population. (EIS-Katz)
W78-08640

LABORATORY EVALUATION OF THE TOXICITY OF NITROCELLULOSE TO AQUATIC ORGANISMS,
E G and G, Bionomics, Wareham, MA.
R. E. Bentley, G. E. LeBlanc, T. A. Hollister, and B. H. Sleight, III.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 749, Price codes: A03 in paper copy, A01 in microfiche. Army Medical and Research Development Command, Washington, D.C. Contract No. DAMD-17-74-C-4101, Final Report September 1977. 33 p, 8 tab, 1 fig, 9 ref.

Descriptors: *Toxicity, *Bioassay, Mortalities, *Laboratory tests, Water pollution effects, Freshwater fish, Algae, Sediments, Aquatic insects, Water quality standards, Phytoplankton, Midges, Industrial wastes, *Selenastrum capricornutum, *Chironomids, Nitrocellulose, Munitions.

The acute toxicity of nitrocellulose was studied utilizing aquatic organisms representing several different trophic levels in aquatic ecosystems. No acutely toxic effects of nitrocellulose were observed among any of the fish, invertebrate or algal species tested except with the green alga Selenastrum capricornutum. Studies with sediments containing nitrocellulose indicated no adverse effects among chironomid populations exposed to 540 mg nitrocellulose/kg of sediment over two generations. Based on an application factor of 0.1 and an EC50 of 579 mg/l for the most sensitive aquatic organism tested (Selenastrum capricornutum), a water quality criteria of 50 mg/l is proposed for the protection of freshwater aquatic life. (EIS-Katz)
W78-08641

EFFLUENT MONITORING PROCEDURES: NUTRIENTS,
Environmental Protection Agency, Cincinnati, OH. Municipal Operations and Training Div.
For primary bibliographic entry see Field 5A.
W78-08642

ENVIRONMENTAL SAMPLING IN THE PANAMA CANAL ZONE,
Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD.
For primary bibliographic entry see Field 5A.
W78-08643

REARING PACIFIC SALMON IN SALTWATER PONDS FERTILIZED WITH DOMESTIC WASTEWATER,
Humboldt State Univ., Arcata, CA.
G. W. Allen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 381, Price codes: A05 in paper copy, A01 in microfiche. Report HSU-SG-10, November 1976. 92 p, 39 tab, 24 fig, 19 ref.

Descriptors: *Salmon, *Aquiculture, *Sewage, *Methodology, Chinook salmon, Rainbow trout, Sockeye salmon, Coho salmon, Juvenile fish, Ponds, *California, Sewage disposal, *Sewage treatment, Sewage lagoons, Water quality, Mortality, Feeding habits, Growth rates, Saltwater ponds, *Humboldt Bay, Arcata, California.

Two 0.15-hectare ponds using mixtures of treated domestic wastewater and seawater were used to rear juvenile salmonids without supplemental feeding. Ponds are located within the periphery of an oxidation pond located on the north arm of Humboldt Bay, Humboldt County, Arcata, California. Forced air and surface spray systems of pond aeration and mixing of pond waters were employed to maintain water quality. Fingerling coho salmon (Oncorhynchus kisutch) and rainbow trout (Salmo gairdneri) were reared together using both ponds. Polyculture of coho and rainbow trout at about 5 fish per square meter planting density resulted in survival rates of 55-85% and a total fish production rate of about 200 kg/ha/yr in both ponds. Survival of chinook salmon was low due to an unusual loss of fry early in the experiment apparently from a combination of supersaturation of the blood with oxygen and/or high pH values. (EIS-Katz)
W78-08645

SENSITIVITY OF VERTEBRATE EMBRYOS TO BORON COMPOUNDS,
Kentucky Univ., Lexington. School of Biological Science.
W. S. Birge, and J. A. Black.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 085, Price codes: A05 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA 560/1-71-008, April 1977. 66 p. 33 tab, 5 fig, 42 ref.

Descriptors: *Bioassay, Rainbow trout, Channel catfish, Amphibians, Frogs, Toads, Water pollution effects, *Toxicity, Mortality, *Boron, Laboratory tests, Freshwater fish, Birds, Methodology, *Boric acid, Leopard frog, Fowler's toads, LC50.

Developmental stages of rainbow trout, channel catfish, goldfish, leopard frog, and Fowler's toad were treated in a continuous flow system with boric and borax concentrations ranging from 0.001-300 ppm boron. Exposure was initiated subsequent to fertilization and maintained through 4 days posthatching, using water with hardness levels of 50 and 200 ppm CaC03. Expressed in ppm boron at 4 days posthatching, LC1 values for trout, catfish, and goldfish were 0.1, 0.5, and 0.6 for boric acid in soft water, 0.001, 0.2 for boric acid in hard water, 0.07, 5.5, and 1.4 for borax in soft water, and 0.07, 1.7, and 0.9 for borax in hard water. LC50 values in ppm for trout, catfish, and goldfish were 100, 155, and 46 for bric acid in soft water, 79, 22, and 75 for boric acid in hard water, 27, 155, and 65 for borax in soft water and 54, 71, and 59 for borax in hard water. The LC50 values for amphibian embryos and larvae ranged from 47 for borax in soft water to 145 for boric acid in soft water. By comparison, boron LC50 values for chick embryos, treated by yolk injection, were 1.0 and 0.5 ppm for boric acid and borax, respectively. (EIS-Katz)
W78-08647

POTENTIAL EFFECTS ON AQUATIC RESOURCES OF PROCESSING AND/OR CONVERSION OF IOWA COAL,
Iowa Cooperative Fishery Research Unit, Ames.
F. I. Barrett, and R. J. Muncy.
Available from the National Technical Information Service, Springfield, VA 22161 as IS-ICP-32, Price codes: A05 in paper copy, A01 in microfiche. Final Report to Fish and Wildlife Service, Report IS-ICP-32, Oct. 1976. 68 p, 1 tab.

Descriptors: *Iowa, *Coal, *Coal mines, *Coal mine wastes, Aquatic environment, Aquatic populations, Environmental effects, Trace elements, *Bibliographies, *Mineral industry, Mining.

A bibliographic research study (584 citations) was completed which is useful for those engaged in coal research, coal composition, conversion or processing or aquatic impact from coal processing. A purpose of the bibliography was to identify sources of information as to major and minor elements and compounds within and from coal. (EIS-Katz)
W78-08648

ECOSYSTEM PROCESSES AND ORGANIC CONTAMINANTS: RESEARCH NEEDS AND AN INTERDISCIPLINARY PERSPECTIVE,
Institute of Ecology, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08649

ON THE DYNAMICS OF EXPLOITED POPULATIONS OF TISBE HOLOTHURIAE (COPEPODA, HARPACTICOIDA),
Biologische Anstalt Helgoland, Hamburg (Germany, FR.). Lab. Suelldorf.
M. Hoppenheit.
Helgolander wissenschaftliche Meeresuntersuchungen, Vol. 29, p 503-523, 1977. 32 ref, 8 fig, 8 tab.

Descriptors: *Copepods, *Cadmium, *Toxicity, Exploitation, *Aquatic populations, *Bioassay, *Aquatic animals, Water pollution effects, Environmental effects, Density, Metals, Laboratory tests, Mortality, Crustaceans, Plankton, Absorption, Tisbe, *Sublethal effects.

A total of 30 weekly exploited populations of the harpaticoid copepod Tisbe holothuriae were exposed to 148 or 222 micro g Cd++/l, combined with exploitation rates of 10, 30, 50, 70 or 90% under conditions of surplus food supply. During the observation period, most populations exhibited distinct U-shaped density trends. Addition of Cd++ prolonged and reinforced the downward trends present in the initial periods of the experiments. If population densities, both in control and test populations, fell short of a certain value, the age structures shifted in favour of the nauplii. More pronounced reductions in population densities of the test populations did not result in increased elevations of the nauplius fraction. Within 23 weeks (or 20 generations), the effect of Cd++ on population density was counteracted by an acclimation process. No relationship could be established between exploitation rate and observed effects. Erroneous assumptions on the adaptability of parametric methods had led to invalid statements on the dispersion of data published in previous papers in this series. These statements have been revised. Possible limitations of the significance of the results obtained are discussed in some detail. (EIS-Katz)
W78-08653

FISH CULTURE WITH GRADIENTS IN OXYGEN CONTENT EXPLOITING THEIR OWN RESPIRATORY CONSUMPTION (IN JAPANESE),
Kagoshima Univ. (Japan). Lab. of Fishing Technology.
T. Yonemori, and Y. Tanaka.
Memoirs of the Faculty of Fisheries, Kagoshima University, Vol. 26, p 173-178, 1977. 4 fig, 2 tab, 2 ref.

Descriptors: *Dissolved oxygen, *Oxygen, *Tilapia, *Respiration, *Aeration, *Growth rates, *Aquiculture, *Freshwater fish, Environmental effects, Fish physiology, Metabolism, Aerobic conditions, Fish management, Water quality.

In order to prepare groups of experimental fish for a further study on swimming power measurement, a 60 days culture using Tilapia mossambica was designed. The apparatus was composed of tanks, siphons, filters, and a submersible pump arranged to form a circulating system. Prior to the fish culture, a preliminary test without fish and aeration was executed and it was concluded that there was no oxygen dissolution into the system. The culturing test was carried out keeping a group of 25 Tilapia in each 200 l tank, and D.O. values for each tank were recorded daily. In this experimental culture, D.O. values for each tank were significantly ordered. According to the conclusion from the preliminary test, the differences in D.O. value between each tank were considered to be caused by their own respiratory consumption. Therefore, oxygen consumption for each group was calculated as follows: Group B: 168.3 ml/kg/hr at D.O. condition of 20 ml/l; Group C: 142.3 ml/kg/hr at D.O. condition of 1.2 ml/l; Group D: 108.1 ml/kg/hr at D.O. condition of 0.6 ml/l. Oxygen consumption for Group A may be calculated by setting a reservoir between the aerating tank and tank A. (EIS-Katz)
W78-08654

UPTAKE OF ORGANIC SUBSTRATES BY CYCLOTELLA CRYPTICA (BACILLARIOPHYCEAE): EFFECTS OF IONS, IONOPHORES AND METABOLIC AND TRANSPORT INHIBITORS,
Toronto Univ. (Ontario). Dept. of Botany.
J. A. Hellebust.
Journal of Phycology, Vol. 14, p 79-83, 1978. 3 tab, 1 fig, 30 ref.

Descriptors: *Diatoms, Biochemistry, *Metabolism, *Sodium chloride, *Ions, *Absorption, *Inhibitors, *Enzymes, *Mode of action, *Biological membranes, *Membrane processes, Salts, Inhibition, Aquatic microorganisms, Aquatic algae, Plankton, Nutrients, Carbohydrates, *Cyclotella, *Glucose uptake, *Metabolic inhibitors.

The uptake of glucose and amino acids by the euryhaline diatom Cyclotella cryptica does not appear to be related to proton gradients. Instead, the transport system for these organic solutes show a strong requirement for the presence of NaCl. The relationship between uptake and NaCl concentration is hyperbolic, with optimal uptake rates being approached at 100 mM NaCl. High concentrations of KCl cause strong reductions in uptake rates. The (Na+, K+)-stimulated ATPase inhibitor anabain has no effect on glucose uptake, whereas the diphenolic glucoside phlorizin and its aglucone phloretin are strongly inhibitory. The proton translocating uncoupler CCCP (carbonylcyanide m-chlorophenyl hydrazone) and the ATPase inhibitor DCCD(dicyclohexylcarbodiimide) both almost completely abolish glucose transport, and low concentrations of the ionospheres monensin and valenomycin strongly inhibit glucose uptake, by the diatom. The requirement of high external NaCl concentrations for glucose transport, and the inhibitory effect on transport of the Na+-specific ionophore monensin are consistent with a coupling of Na+ and organic substrate transport, but could

also be explained by a Na+ requirement for glucose binding to a transport carrier, and/or a possible interference with energy producing reactions associated with a monensin-induced collapse of the normal Na+ gradient. (EIS-Katz)
W78-08659

HEAVY METALS IN MUSSELS (MYTILUS GALLOPROVINCIALIS) FROM THE GULF OF LA SPEZIA AND FROM THE PROMONTORY OF PORTOFINO, ITALY,
Genoa Univ. (Italy). Inst. of General and Inorganic Chemistry.
R. Capelli, V. Contardi, B. Fassone, and G. Zanicchi.
Marine Chemistry, Vol 6, p 179-185, 1978. 12 ref. 3 tab, 2 fig.

Descriptors: *Mussels, *Heavy metals, *Cadmium, *Chromium, *Mercury, *Manganese, *Lead, *Zinc, *Path of Pollutants, Invertebrates, Mollusks, Shellfish, Absorption, Spectrophotometry, Metals, Water pollution effects, Bioindicators, Monitoring, Marine animals, Bioaccumulation, Tissue analysis, *La Spezia(Italy), *Promontory of Portofino(Italy).

In different samples of Mytilus galloprovincialis Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, and Zn were determined by AAS. The mussels were taken from 11 sites in the Port of La Spezia. Typical concentration ranges (micro g/g dry weight) were as follows: Cd, 2.0-6.8; Co, 0.8-3.2;, Cr, 5.8-19.5; Cu, 6.9-33.7; Hg, 0.15-0.38; Mn, 11.8-37.8; Ni, 1.3-10.9; Pb, 13.9-44.6; and Zn, 203-379. Other samples were collected at 4 sites on the Promontory of Portofino and the following values were obtained: Cd, 0.8-1.1; Co, 2.6-2.9; Cu, 3.3-4.2; Hg, 0.09-0.15; Mn, 6.3-9.1; Ni, 1.2-2.4; Zn, 120-140. (EIS-Katz)
W78-08661

A STUDY ON THE MERCURY CONTENT IN MUSCLES OF THE FISH FAMILY CARANGIDAE FROM THE FISHING GROUNDS OFF THE COAST OF NORTH-WEST AFRICA,
Institute of Marine Food Technology, Szczecin (Poland).
A. Chodyniecki, M. Kurpios, M. Protasowicki, and J. Babinska.
Acta Ichthyologica et Piscatoria, Vol 6, No 2, p 118-124, 1976. 3 tab, 9 ref.

Descriptors: *Mercury, *Absorption, *Marine fish, Weight, *Heavy metals, Path of pollutants, Metals, Fish, Commercial fish, Commercial fishing, Water pollution effects, Africa, Tissue analysis, *Trachurus, *Carangidae, Muscle tissue.

The mercury content in muscles was determined for 171 fishes belonging to three species of the family Carangidae. Significant differences in the content of this element were found between the species. Moreover, as regards the horse mackerel (Trachurus trachurus) no correlation was detected between the weight of fishes and the amount of mercury and no difference in the level of this element between males and females. (EIS-Katz)
W78-08662

AN ATTEMPT TO REAR RAINBOW TROUT (SALMO GAIRDNERI RICH., 1863) IN A TEMPERATURE CONTROLLED TANK,
Institute of Ichthyology, Szczecin (Poland). Dept. of Hydrozoology.
L. Szlauer, and Z. Piesik.
Acta Ichthyologica et Piscatoria, Vol 6, No 2, p 125-135, 1976. 7 ref, 3 tab, 1 fig.

Descriptors: *Rainbow trout, *Aquiculture, *Water temperature, *Mortality, *Oxygen, *Methodology, *Design, *Habitats, *Fish diseases, Trout, Sport fish, Salmonids, Fish farming, Temperature, Productivity, Seasonal, Thermal stress, Aquatic productivity, Fish management, Water quality.

Rainbow trout were kept for 1 year in a tank of 2.5 cubic capacity, protected from overheating in summer and heated in winter. No water change was applied during the culture period. The fisheries were cultured and showed good weight increments: the average weight of an 18-month old specimen was 193.3 g. (EIS-Katz)
W78-08663

AN EXPERIMENTAL APPROACH IN STUDYING THE INFLUENCE OF MERCURY ON A NORTH SEA COASTAL PLANKTON COMMUNITY,
Central Lab., TNO, Delft (Netherlands).
J. Kuiper.
Helgolander wissenschaftliche Meeresuntersuchungen, Vol 30, p 652-665, 1977. 7 fig, 4 tab, 44 ref.

Descriptors: *Plankton, *Biological communities, *Mercury, *Water pollution effects, *Environmental effects, *Growth rates, On-site investigations, *Primary productivity, *Aquatic microorganisms, *Algae, *Sediments, Phytoplankton, Zooplankton, Laboratory tests, Productivity, Methodology, Monitoring, Diatoms, Copepods, Adsorption, Path of pollutants, Analytical techniques, *Plastic bag method.

The development of North Sea coastal plankton communities in four simultaneously filled plastic bags was followed for one month. To obtain a concentration of 5 ppb in the water phase a single dose of mercuric chloride was added to two of the bags. This addition had a close impact on the development of the phytoplankton, while that on the zooplankton and the decomposers was less clear. In the course of the experiment, methylation of the added mercury proceeded in the sediment in the bags. The 'plastic bag method' seems to be a suitable tool in toxicological research. (EIS-Katz)
W78-08664

HOMING OF MORPHOLINE-IMPRINTED BROWN TROUT, SALMO TRUTTA,
Wisconsin Univ.-Madison. Lab. of Limnology.
A. T. Scholz, J. C. Cooper, R. M. Horrall, and A. D. Hasler.
Fishery Bulletin, Vol. 76, No. 1, p 293-295, 1978. 1 fig, 2 tab, 8 ref.

Descriptors: *Brown trout, *Salmonids, *Fish behavior, *Spawning, *Odor, *Fish migration, *Trout, Migration, Life cycles, Fish reproduction, Fish establishment, Sport fish, Fish hatcheries, Animal behavior, *Homing Cues, *Morpholine.

Eighteen-month-old hatchery-raised brown trout were exposed to a synthetic chemical, morpholine, for 40 days and the stocked in Lake Michigan. During the spawning migration the fish homed to a simulated home stream which was scented with morpholine. Over 17% of the treated fish were recovered from the simulated home stream compared to 1% of a control group released with the treated fish. To locate the scented stream morpholine fish searched a distance of at least 13km. Since the life cycle of migratory brown trout is similar to that of coho salmon and rainbow trout, the study was conducted to determine if the odor imprinting could be extended to brown trout. (EIS-Katz)
W78-08665

ACCUMULATION OF POLYCHLORINATED BIPHENYLS IN THE COCKLE CERASTODERMA EDULE AND THE TELLIN MACOMA BALTHICA,
London Univ. (England). Dept. of Zoology.
W. J. Langston.
Marine Biology, Vol. 45, p 265-272, 1978. 22 ref, 3 fig, 3 tab.

Descriptors: *Arochlor, *Polychlorinated biphenyls, *Crustaceans, *Invertebrates, *Sea water, *Absorption, *Bioassay, *Chlorine, *Path of pollutants, *Chemical properties, *Mollusks, Chlorinated hydrocarbon pesticides, Monitoring, Laboratory tests, Halogens, Gas chromatography, Shellfish, *Cerastoderma, *Macoma, Bioaccumulation, *Cockles.

Two species of marine bivalve, Cerastoderma edule and Macoma balthica were exposed to particles contaminated with three commercial polychlorinated biphenyl (PCB) mixtures, Arochlors 1242, 1254, and 1260. The accumulation of PCB in bivalve tissue was monitored for periods of up to 40 days. In addition to measuring total PCB concentrations, which reached 60 ppm of Arochlor in M. balthica, the fate of individual PCB homologues of different chlorine content, ranging from 2 to 8 chlorine atoms per biphenyl molecule, was also determined. Selective accumulation of PCBs with 5 chlorine atoms per biphenyl molecule occurred, whilst isomers of very low and very high molecular weights were accumulated at much slower rates. (EIS-Katz)
W78-08666

REACTION OF ESTUARINE ECOSYSTEMS TO EFFLUENT FROM PULP AND PAPER INDUSTRY,
Aberdeen Univ. (Scotland). Dept. of Microbiology.
N. J. Poole, R. J. Parkes, and D. J. Wildish.
Helgolander wissenschaftliche Meeresuntersuchungen, Vol. 30, p 622-632, 1977. 23 ref, 10 fig, 1 tab.

Descriptors: *Pulp wastes, Pulp and paper industry, *Estuaries, *Biodegradation, *Water pollution sources, *Oxygen demand, *Primary productivity, *Water pollution effects, *Light penetration, *Lignins, *Water temperature, Estuarine environment, Waste water pollution, Light, Cellulose, Effluents, Organic compounds, Sulfides, Sediments, Toxicity, Tidal waters, Impoundments, Seasonal, Aquatic microorganisms, Ecosystems, *L'Etang River(Canada), *Lignosulphonate.

A major problem associated with the discharge of pulp or paper-mill effluent into shallow estuarine ecosystems, such as the upper L'Etang in Canada or in the Don in Scotland, is the development of anoxic conditions in water column and sediment. The effluent modifies the balance, within the ecosystem, between the supply of, and demand for, oxygen. The lignosulphonate component of pulp-mill effluent blocks transmission of light energy to photosynthetic green plants. The oxygen demand is increased by the microbial degration of the additional organic matter in water and sediment. The addition of cellulose pulp fibre to he sediment also results in an increase in the concentration of their metabolic by-product, sulphide. The oxidation of sulphide exerts an additional oxygen demand on the system, which is an important factor in the development and maintenance of anoxic conditions. It is suggested that temperature is an important factor in controlling the release of sulphide from the sediment into the overlying water and in modifying the toxicity of sulphide towards the bacterial populations and, therefore, the capacity of the ecosystem to cope with the effluent. (EIS-Katz)
W78-08667

THE INVASTION OF ASIATIC CLAM, CORBICULA MANILENSIS IN THE NEW RIVER, VIRGINIA,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
J. H. Rodgers, Jr., D. S. Cherry, J. R. Clark, K. L. Dickson, and J. Cairns, Jr.
The Nautilus, Vol. 91(2), p 43-46, 2 tab, 10 ref, April 25, 1977.

Descriptors: *Virginia, *Mollusks, Freshwater, *Benthos, *Thermal power plants, Thermal water, *Clams, Water temperature, *Thermal pollution,

*Asiatic clam, Corbicula manilensis, *New River(Va), *Glen Lyn(Va), Coal fired generating plant(Va).

Corbicula manilensis appears to have successfully invaded the New River at Glen Lyn, Giles County, Virginia in 1975. Mean population densities of 18 Corbicula, m-2 were recovered downstream from a coal-fired generating plant while 29 individuals m-2 were found immediately upstream. This seems to be the present limit of Corbicula immigration in the New River as no speciments were taken from sampling sites farther upstream. (EIS-Katz)
W78-08668

EFFECTS OF ELEMENTAL PHOSPHORUS ON THE BIOTA OF YELLOW LAKE, PINE BLUFF ARSENAL, ARKANSAS, MARCH 1974 - JANUARY 1975,
Edgewood Arsenal, Aberdeen Proving Ground, MD. Ecological Research Office.
J. G. Pearson, E. S. Bender, D. H. Taormina, K. L. Manual, and P. F. Robinson.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A035 925, Price codes: A06 in paper copy, A01 in microfiche. Technical Report EO-TR-76077, December 1976. 124 p, 39 tab, 23 fig, 56 ref.

Descriptors: *Water pollution effects, *Macroinvertebrates, *Arkansas, *Lakes, *Phosphorus, Oligochaetes, Limnology, Industrial wastes, *Aquatic environment, Aquatic population, Public health, Path of pollutants, Seasonal, Methodology, Data processing, *Elemental phosphorus, Macroinvertebrates, Species diversity, *Statistical analysis, Limnodrilus.

The effect of wastewaters contaminated with elemental phosphorus on the biota of a shallow lake was investigated during a year. The wastewaters were discharged from a white phosphorus munitions-filling facility at Pine Bluff Arsenal, Arkansas. Species abundance and distribution of benthic macroinvertebrates were affected by the concentration of elemental phosphorus in the water and sediments of a shallow Arkansas lake which received wastewater from a munitions filling operation. Samples were collected from 18 stations in a 200-acre lake for macroinvertebrate sediment analyses and water chemistry. From species diversity, cluster analysis, and the index of biotic similarity, seasonal and spatial patterns of macroinvertebrates distribution were identified and compared. (EIS-Katz)
W78-08669

VALIDITY OF LABORATORY TESTS FOR PREDICTING COPPER TOXICITY IN STREAMS,
Environmental Protection Agency, Cincinnati, OH.
For primary bibliographic entry see Field 5A.
W78-08670

EFFECTS OF SUSPENDED SEDIMENT ON FISH EGGS AND LARVAE: A LABORATORY ASSESSMENT,
Envirosphere Co., Norcross, GA.
A. H. Auld, and J. R. Schubel.
Estuarine and Coastal Marine Science, Vol. 6, p 153-164, 1978. 1 fig, 11 tab, 17 ref.

Descriptors: *Suspended solids, *Sediment transport, *Sediment load, *Estuarine environment, *Fish eggs, *Larval growth stage, *Fish reproduction, *Mortality, *Toxicity, *Yellow perch, *Herring, *Striped bass, *Dredging, Sediments, Water pollution sources, Estuaries, Chesapeake Bay, *Shad.

Eggs and larvae of 6 species of anadromous and estuarine fish indigenous to the Chesapeake Bay were exposed to concentrations of suspended sediment ranging from a few mg l-1 to 1000 mg l-1 to determine the effects of different concentrations on hatching success and short term survival. The egg experiments indicated that concentrations of up to 1000 mg l-1 did not significantly affect the hatching success of yellow perch, blueback herring, alewife or American shad eggs. Concentrations of 1000 mg l-1 significantly reduced (P less than 0.05) the hatching success of white perch and striped bass, but lower concentrations did not. Experiments with larvae indicated that concentrations of greater than or equal to 500 mg l-1 significantly reduced (P less than 0.05) the survival of striped bass and yellow perch larvae exposed for 48-96 h. American shad larvae appeared to be less tolerant than the other two species tested. Concentrations greater than or equal to 100 mg l-1 significantly reduced the survival of shad larvae continuously exposed for 96 h. The significance of these results are discussed relative to natural and man-induced changes in sediment loading of estuaries. (EIS-Deal)
W78-08671

EFFECTS OF LOW TEMPERATURE ON THE SURVIVAL AND BEHAVIOR OF THREADFIN SHAD, DOROSOMA PETENENSE,
Oak Ridge National Lab., TN. Environmental Sciences Div.
J. S. Griffith.
Transactions of the American Fisheries Society, Vol. 107, No. 1, p 63-70, 1978. 2 fig, 3 tab, 17 ref.

Descriptors: *Water temperature, *Mortality, *Toxicity, *Fish physicology, *Heat resistance, *Water cooling, *Thermal stress, *Fish behavior, *Entrainment, *Cold resistance, Ecology, Fish populations, *Threadfin shad, *Shad, *Dorosoma, *Impingement.

Laboratory studies assessed the effects of gradual and rapid decreases in temperature on 9-14-cm long threadfin shad collected from a tributary of the Tennessee River. Fish acclimated to 15C and exposed to temperatures cooling 1C each 72 hours decreased in feeding activity and schooled less compactly beginning at 9C. At lower temperatures they lost orientation and were insensitive to external stimuli, and none survived exposure to 4C. Threadfin shad exposed to sudden cooling (2 to 5C decreases in 4 hours) lost equilibrium in proportion on the magnitude of temperature decrease if minima of 4 to 6C were reached. Cold-shocked fish that had lost equilibrium of 0.2, 30, and 90 minutes before being returned to warmer water experienced mortalities of 32, 79, and 94%, respectively. (EIS-Deal)
W78-08672

SELECTIVE UPTAKE OF 55FE FROM SEAWATER BY ZOOPLANKTON,
Oregon Coll. of Education, Monmouth.
C. D. Jennings.
Marine Science Communications, Vol. 4, No. 1, p 49-58, 1978. 1 tab, 13 ref.

Descriptors: *Iron, *Absorption, *Zooplankton, *Plankton, *Metabolism, *Stable isotopes, *Radioisotopes, *Radioecology, *Diatoms, Ecosystems, Sea water, Pacific Ocean, *Selective absorption.

Iron-55 was measured in water and mixed zooplankton collected in the South Pacific Ocean. The ratios of the specific activity of 55Fe (pCi/g Fe) between plankton and water from the same locations appear to be about 100, which suggests that zooplankton took up 55Fe in preference to stable iron in the South Pacific Ocean. (EIS-Deal)
W78-08673

INTERACTIONS OF TOXAPHENE AND VITAMIN C IN CHANNEL CATFISH,
Fish and Wildlife Service, Columiba, MO. National Fisheries Research Lab.
F. L. Mayer, P. M. Mehrle, and P. L. Crutcher.
Transactions of the American Fisheries Society, Vol. 107, No. 2, p 326-333, 1978. 2 fig, 5 tab, 47 ref.

Descriptors: *Fish physiology, *Channel catfish, *Organic pesticides, *Vitamins, Biochemistry, Metabolism, Nutrient requirements, Catfishes, Organic compounds, Chlorinated hydrocarbon pesticides, Environmental effects, *Vitamin C, *Toxaphene, Bioaccumulation, Tissue analysis, Bone tissue, Histology, Detoxification.

The involvement of vitamin C as a cofactor in detoxification mechanisms of fish was investigated by feeding selected amounts of the vitamin in diets of fingerling channel catfish (Ictalurus punctatus) that were concurrently exposed to toxaphene. After 150 days of toxaphene exposure, backbone collagen was significantly decreased in fish fed diets containing 63 mg/kg of vitamin C. Spinal deformities were common among fish fed low vitamin C diets, but the incidence decreased as dietary vitamin C increased. Vitamin C concentrations in the backbone of toxaphene-exposed fish were significantly lower than in controls, suggesting that the insecticide caused a functional vitamin C deficiency in bone tissue. Effects of vitamin C and toxaphene interactions concerning mucous cell number, epidermal thickness, growth, bone development, and skin lesions were discussed. (EIS-Klein)
W78-08674

THE PREFERRED TEMPERATURES OF THE BROWN BULLHEAD, ICTALURUS NEBULOSUS, WITH PREFERENCE TO ITS ORIENTATION TO THE DISCHARGE CANAL OF A NUCLEAR POWER PLANT,
Ecological Analysts, Inc., Melville, NY.
F. P. Richards, and R. M. Ibara.
Transactions of the American Fisheries Society, Vol. 107, No. 2, p 288-294, 1978. 2 fig, 1 tab, 20 ref.

Descriptors: *Bullheads, *Water temperature, Thermal water, *Thermal stress, Catfishes, *Heated water, Fish behavior, Water quality, *Thermal pollution, Temperature, Discharge(Water), Environmental effects, Nuclear powerplants, *Brown bullhead.

Brown bullheads acclimated to temperatures between 3.5 and 28C and tested in a thermal gradient trough usually preferred water temperatures above their respective acclimation temperatures. Fish tended to gravitate toward higher temperatures the longer they remained in the gradient; final preferendum was 27.3C. Laboratory results were consistent with observed movements of Connecticut River brown bullheads into thermal discharge canal of a power plant during autumn. It appeared from both laboratory and field studies that a 'temperature trap' kept bullheads in the warm discharge canal during winter. However, brown bullheads left the canal in spring sooner than was predicted from temperature preference data alone. (EIS-Klein)
W78-08675

A TEMPERATURE ALGORITHM FOR MODIFYING BIOLOGICAL RATES,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
K. W. Thornton, and A. S. Lessem.
Transactions of the American Fisheries Society, Vol. 107, No. 2, p 284-287, 1978. 4 fig, 1 tab, 14 ref.

Descriptors: *Water temperature, *Equations, Fish physiology, Mortality, Growth rates, Respiration, Research and development, Mathematical studies, Temperature, Metabolism, Methodology, *Algorithms, Biologica rates, Logistic equations.

An algorithm for modifying biological rates as a function of temperature was developed using the basic form of the logistic equation. Versions of this basic equation were used to modify growth,

respiration, and mortality rates as a function of four characteristic temperatures. (EIS-Katz)
W78-08676

SEASONAL LARVAL FISH ABUNDANCE IN WATERS OFF DIABLO CANYON, CALIFORNIA,
Pacific Gas and Electric Co., San Ramon, CA. Dept. of Engineering Research.
J. W. Icanberry, and J. W. Warrick.
Transactions of the American Fisheries Society, Vol. 107, No. 2, p 225-233, 1978. 2 fig, 1 tab, 43 ref.

Descriptors: *Growth stages, *Fish population, *Marine fish, *Seasonal, Fish eggs, Larvae, Productivity, Density, Sampling, Biomass, *California, Fish reproduction, Life cycles, Nuclear powerplants, Littoral, Systematics, Speciation, Coasts, Community development, Species composition, *Diablo Canyon(Calif).

A 15-month study was conducted to describe the seasonal changes of total larval fish densities, fish eggs densities, and species composition in the nearshore marine environment of Diablo Canyon, San Luis Obispo County, California. Samples were collected at an inshore and offshore station located 300 n and 1,500 m southwest of the seaward perimeter of Diablo Cove, respectively. There were no statistical differences in total larval fish densities and total fish egg densities between inshore and offshore stations. Statistical differences were found in two of the six most abundant taxa, Artedius spp. (greater densities found inshore) and Stenobrachius leucopsarus (greater densities present offshore). The greatest larval fish densities occurred January to March 1975. A peak fish egg density occurred in September 1975. A comparison of day and night hauls resulted in no statistically significant differences in densities or lengths of larval Sebastes spp. (EIS-Klein)
W78-08678

TOXICITY OF SILVER TO RAINBOW TROUT (SALMO GAIRDNERI),
Colorado Div. of Wildlife, Fort Collins. Research Center.
P. H. Davies, J. P. Goettl, Jr., and J. R. Sinley.
Water Research, Vol. 2, p 113-117, 1978. 2 fig, 4 tab, 17 ref.

Descriptors: *Salmonids, *Trout, *Rainbow trout, *Metals, *Toxicity, Growth stages, Fry, Fish reproduction, Spawning, Lethal limit, Water quality, Fish behavior, Growth rates, Mortality, Hardness(Water), Water properties, Environmental effects, Fish physiology, *Silver, Bioaccumulation.

The mean 96-h LC50's of silver with rainbow trout were 6.5 micrograms/liter and 13.0 micrograms/liter in soft and hard water, respectively. The long-term no effect concentration of silver added to water as silver nitrate was between 0.09 and 0.17 micrograms/liter after 18 months exposure in soft water. No mortalities occurred at 0.09 micrograms/liter, whereas 17.2% mortality occurred to fish exposed to 0.17 micrograms/liter. The no effect concentration did not reflect possible effects of silver on spawning behavior or reproductions. At concentrations of 0.17 micrograms/liter or greater, silver caused premature hatching of eggs and reduced growth rate in fry. The prematurely erupted fry were not well developed and frequently died. The growth rate of surviving fry was greatly reduced. (EIS-Klein)
W78-08679

CHRONIC TOXICITY OF HYDROGEN CYANIDE TO THE BLUEGILL,
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries and Wildlife.
G. L. Kimball, L. L. Smith, Jr., and G. J. Broderius.
Transactions of the American Fisheries Society, Vol. 107, No. 2, p 341-345, 1978. 2 tab, 17 ref.

Descriptors: *Toxicity, *Elements(Chemical), Fish physiology, Life cycles, Growth stages, Fish eggs, Fry, Fish reproduction, Resistance, Environmental effects, Fish behavior, Laboratory tests, Water quality, Bioassay, *Hydrogen cyanide, *Cyanide, *Bluegill, Lepomis macrochirus, Survival.

The bluegill, Lepomis macrochirus, was subjected to various concentrations of hydrogen cyanide to determine the effects on long-term survival, growth, egg production, and egg hatchability. Intermittent-flow experiments were conducted using adults, juveniles, and newly hatched eggs in separate tests. Egg production was most sensitive to hydrogen cyanide, and the highest concentration with no adverse effects was below 5.2 micrograms/liter HCN. Fry survival through the first 6 weeks followed in sensitivity with the no-adverse-effect level occurring between 15.6 and 19.4 micrograms/liter HCN. (EIS-Klein)
W78-08680

THE EFFECTS OF VEGETATION REMOVAL BY GRASS CARP ON WATER CHEMISTRY AND PHYTOPLANKTON IN INDIANA PONDS,
Purdue Univ., Lafayette, IN. Dept. of Botany and Plant Pathology.
C. A. Lembi.
Transactions of the American Fisheries Society, Vol. 107, No. 1, p 161-171, 1978. 1 fig, 6 tab, 29 ref.

Descriptors: *Phytoplankton, *Dissolved oxygen, *Carp, *Nutrients, *Potassium, *Dinoflagellates, *Phosphorus, *Nitrogen, *Herbivores, *Food chains, *Trophic level, *Biocontrol, *Eutrophication, Water chemistry, Water quality, Ecosystems, *Indiana, Ctenopharyngodon.

Water quality parameters and phytoplankton in ponds stocked with grass carp, Ctenopharyngodon idella (test ponds) and in control ponds were compared during the summers of 1975 and 1976. Grass carp rapidly consumed available aquatic vascular plants. Dissolved oxygen levels in test ponds remained high as long as bottom growths of the filamentous green alga, Spirogyra sp. were present, but consumption of this alga in addition to vascular vegetation led to significantly lower dissolved oxygen concentrations in the water directly above the sediments. The most consistently affected parameters were turbidity and potassium concentrations, both of which were significantly higher in test ponds. Phytoplankton populations consisting primarily of dinoflagellates were not affected by grass carp introduction. As much as 54% of the phosphorus and 42% of the nitrogen released by consumption of plants were incorporated into new fish tissue. Most of the phosphorus not taken up by the fish was sequestered into components other than water or phytoplankton. Estimated potassium incorporation into fish tissue was low (2.5% or less), and recovery in water was approximately 2- to 6-fold higher than phosphorus. Potassium in the water appeared to be an excellent indicator of vegetation consumption by grass carp. (EIS-Deal)
W78-08681

THE EFFECT OF METHYL PARATHION ON PREDATOR CHOICE OF TWO ESTUARINE PREY SPECIES,
University of West Florida, Pensacola. Faculty of Biology.
J. A. Farr.
Transactions of the American Fisheries Society, Vol. 107, No. 1, p 87-91, 1978. 3 fig, 2 tab, 26 ref.

Descriptors: *Fish behavior, *Pesticide toxicity, *Animal behavior, *Killifishes, *Fundulus species, *Predation, *Minnows, *Shrimp, *Insecticides, *Organophosphorous pesticides, *Toxicity, *Prey fish, Path of pollutants, Water pollution effects, *Methyl parathion, *Parathion, Sub-lethal effects, Species diversity.

Fundulus grandis, the gulf killifish, was provided a prey choice of grass shrimp, Palaemonetes pugio, and juvenile sheepshead minnows, Cyprinodon variegatus. Fundulus grandis consumed a greater proportion of grass shrimp when both prey species were exposed to the pesticide methyl parathion when prey were not exposed. The relative number of shrimp eaten increased with the concentration of methyl parathion. Such an effect in an estuary could result in altered species composition and species diversity. (EIS-Deal)
W78-08682

FIELD AND LABORATORY AVOIDANCE REACTIONS BY BLUE CRABS (CALLINECTES SAPIDUS) TO STORM WATER RUNOFF,
Florida State Univ., Tallahassee. Dept. of Biological Science.
R. A. Laughlin, C. R. Cripe, and R. J. Livingston.
Transactions of the American Fisheries Society, Vol. 107, No. 1, p 78-86, 1978. 2 fig, 4 tab, 27 ref.

Descriptors: *Crabs, *Animal behavior, *Hydrogen ion concentration, *Acidic water, Clear-cutting, Lumbering, Runoff, *Storm runoff, *Acidity, *Juvenile growth stage, Crustaceans, Water pollution sources, Water pollution effects, *Avoidance reactions, *Blue Crabs, *Callinectes.

A combined field and laboratory study was conducted to determine the avoidance reactions of blue crabs to highly colored, acidic runoff from clear-cut timber areas above a productive north Florida estuary. Blue crabs of two age groups showed marked laboratory avoidance of runoff (pH4.6, 5.8) and of test water with experimentally reduced pH. Within the pH range 4.5-7.0, there was an inverse relationship between pH and avoidance. Water color appeared to play a minor role in the avoidance reactions. Field data gave divergent results. Small crabs were abundant in areas characterized by pH levels strongly avoided under laboratory conditions. Large crabs, however, were conspicuously absent from such areas in the field, indicating possible avoidance. Factors other than pH were thought to be functional in the field distribution of the crabs. This study indicates that laboratory experiments without associated field studies may cause misleading results if they are applied to a determination of impact criteria. (EIS-Deal)
W78-08683

ACUTE TOXICITY AT ANNACIS ISLAND PRIMARY SEWAGE TREATMENT PLANT,
International Pacific Salmon Fisheries Commission, New Westminster (British Columbia).
J. A. Servizi, D. W. Martens, and R. W. Gordon.
Progress Report No. 38, 1978. 12 p, 3 tab, 13 ref.

Descriptors: *Toxicity, Mortality, Bioassay, *Sockeye salmon, Juvenile fish, *Sewage chlorination, Chlorine, Laboratory tests, Water pollution effects, *Sewage disposal, *Sewage effluents, Nitrites, Metals, Surfactants, Ammonia, *Canada, Vancouver, British Columbia, *Dechlorinated primary sewage, Oncorhynchus.

Continuous flow and static bioassays of dechlorinated primary sewage were conducted at Annacis Island sewage plant using fingerling sockeye salmon (Oncorhynchus nerka). Geometric mean survival time (GMST) was determined using undiluted effluent and survival during 96 hr exposure to a range of dilutions was measured. Acute toxicity was greater during continuous flow than during static bioassays. In addition, acute toxicity was greater during dry weather than during wet weather flow conditions. Mortalities were usually 100% during bioassays of 65% v/v dechlorinated sewage but no mortalities occurred at 10% v/v. Results were compared with acute toxicities measured at three other primary sewage treatment plants in the Greater Vancouver Sewerage and Drainage District, plus primary plants in San Francisco and Seattle. Summation of toxic units at-

tributed to anionic surfactants, un-ionized ammonia, cyanide, nitrite and metals measured failed to account for all the acute toxicity measured. (EIS-Katz)
W78-08684

MERCURY FEEDING SCHEDULES: EFFECTS ON ACCUMULATION, RETENTION AND BEHAVIOR IN TROUT,
Idaho State Univ., Pocatello. Det. of Psychology.
A. M. Hartman.
Transactions of the American Fisheries Society, Vol. 107, No. 2, p 369-375, 1978. 4 tab, 16 ref.

Descriptors: *Salmonids, *Mercury, *Fish physiology, *Rainbow trout, Bioassay, Path of pollutants, Fish behavior, Metabolism, Analytical techniques, Toxicity, Feeds, *Bioaccumulation, Feeding schedules, Tissue analysis, *Ceresan, Ethyl-mercury.

Rainbow trout were exposed to 0.5 and 2.0 micrograms/g doses of ethyl-mercury 'Ceresan' daily for one year and 2.5 and 10 micrograms/g doses delivered every 5th day of feeding during the year. In another study, dose levels from 5.0 to 25.0 micrograms/g Ceresan were administered. At the lower doses, mercury concentrations in muscle were similar to the average daily index of dose for 6 months. At 9 months the concentration showed a breakdown of the effect in all groups except for the group fed the lowest mercury concentration. Both dose level and scheduling influenced the mercury concentration in muscle. At the higher concentrations, the muscle mercury concentration was dose related. Beyond performance on the learning task, there was no evidence of impairment of general behavior nor any indication of physical debilitation. Loss of mercury from the tissues appeared to be fairly rapid. (EIS-Klein)
W78-08685

AN ASSESSMENT OF SAMPLING MORTALITY OF LARVAL FISHES,
Nebraska Univ., Lincoln. School of Life Sciences.
G. F. Cada, and G. L. Hergenrader.
Transactions of the American Fisheries Society, Vol. 107, p 269-274, 1978. 2 fig, 3 tab, 9 ref.

Descriptors: *Nuclear powerplants, *Mortality, *Larval growth stage, Freshwater fish, Growth stages, Methodology, Productivity, Population, Equations, Toxicity, Sampling, Data collections, Water pollution sources, Aquatic life, Discharge(Water), *Missouri River, Effluents, Plankton.

High mortalities of larval fishes were observed not only in the discharge collections of two nuclear power plants on the Missouri River but also in control samples taken upriver from the plants where no entrainment effects were possible. Therefore, entrainment mortality generally could not be demonstrated. A technique was developed which indicated that a significant portion of the observed mortality above the power plants was the result of net-induced sampling mortality, and a direct relationship existed between observed mortality and water velocity in the nets when sampling at the control sites, which was described by linear regression equations. When these equations were subsequently used to remove the effects of wide differences in sampling velocities between control and discharge collections, significant entrainment mortality was noted in all cases. The equations were also used to derive estimates of the natural mortality of ichthyoplankton in this portion of the Missouri River.
W78-08686

PARALYTIC TOXINS IN THE DINOFLAGELLATE GONYAULAX EXCAVATA AND IN SHELLFISH,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
A. W. White, and L. Maranda.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 397-402, 1978. 2 fig, 3 tab, 23 ref.

Descriptors: *Toxins, *Algal toxins, *Dinoflagellates, *Bioassay, *Fluorometry, *Animal physiology, *Shellfish, *Growth rates, *Mussels, *Clams, Chemical analysis, Biochemistry, *Gonyaulax, *Mya, *Modiolus, *Saxitoxin.

Paralytic toxins were examined quantitatively in a culture of Gonyaulax excavata and in shellfish by the standard mouse bioassay and by an alkaline peroxide oxidation-fluorometric assay for saxitoxin (STX). The dinoflagellate probably contains at least three toxins, including STX, which represents 3-20% of the total toxin load. In toxic shellfish from nature and in shellfish fed G. excavata under controlled conditions the relative amounts of toxins differed from those in G. excavata, suggesting toxin interconversions and interferences with the chemical assay by other toxins than STX. The consistency in the relationships between bioassay and chemical assay results for clam samples was fair, although the chemical assay measured from 16 to 48% of the bioassay. The chemical assay is questionable as an indicator of total toxin content, and unitl further data ae accumulated the mouse bioassay is considered more reliable for measuring paralytic, G. excavata toxins in shellfish.
W78-08687

POLAROGRAPHIC STUDIES OF THE NATURE OF CADMIUM IN SCALLOP, OYSTER, AND LOBSTER,
Fisheries and Marine Service, halifax (Nova Scotia).
For primary bibliographic entry see Field 5A.
W78-08688

PH-INDUCED CHANGES IN BLOOD LEAD OF LEAD-EXPOSED RAINBOW TROUT (SALMO GAIRDNERI),
Canada Centre for Inland Waters, Burlington (Ontario).
P. V. Hodson, B. R. Blunt, and D. J. Spry.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 437-445, 1978. 5 fig, 1 tab, 17 ref.

Descriptors: *Hydrogen ion concentration, *Rainbow trout, *Lead, *Toxicity, *Fish physiology, *Animal metabolism, *Juvenile growth stage, *Absorption, Water chemistry, *Mortality, *Biological membranes, Permeability, *Membrane processes, *Equilibrium, Path of pollutants, Water pollution effects, Blood, *Bioaccumulation, Tissue analysis.

Blood of juvenile rainbow trout exposed to lead in water showed increasing lead concentrations as pH of the test water decreased from 10.0 to 6.0. A decrease in pH by 1.0 unit from any reference pH resulted in an increase of blood lead by a factor of 2.1. Since sublethal lead toxicity in related to uptake, these results suggest that toxicity increases as pH decreases. Control experiments indicated that reactions of lead with inorganic constituents of the test water were complete within 3 h and that blood lead was at equilibrium with water lead within 48-hr. Therefore, at the time of the blood sampling in the pH experiment, both lead complexation processes in the exposure system, plus lead uptake and release from the blood, were at equilibrium. (EIS-Deal)
W78-08689

TISSUE UPTAKE, SUBCELLULAR DISTRIBUTION, AND METABOLISM OF 14CH3HGCL AND CH3(203)HGCL BY RAINBOW TROUT, SALMO GAIRDNERI,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Physiology.
K. R. Olson, K. S. Squibb, and R. J. Cousins.
Journal of the Fisheries Research Board of Canada, Vol. 35, No. 4, p 381-390, 1978. 2 fig, 5 tab, 46 ref.

Descriptors: *Absorption, *Mercury, *Tracers, *Rainbow trout, *Cytological studies, *Proteins, *Enzymes, *Fish physiology, *Animal metabolism, *Radioactivity techniques, *Biochemistry, Path of pollutants, Chromatography, *Methylmercury, Gills, *Tissue analysis, *Bioaccumulation, *Inorganic mercury, *Metallothionein, *Detoxification.

Uptake, whole tissue, and subcellular distribution of methylmercury (MeHg) by rainbow trout was studied during, and in three-2-wk intervals following a single 24-h exposure to 14CH3HgCl and CH3(203)HgCl. Gills contained approximately 10 times as much MeHg as any other tissue after 24-hr exposure whereas concentrations were lowest for brain and skeletal muscle. In the 2-wk period following exposure, gill MeHg concentrations decreased to levels comparable with most other tissues. Methylmercury in most other tissues increased and then decreased during the subsequent 4-wk period. Methylmercury levels in brain, skeletal muscle, and gonad were highest at 6 wk. During the 6-wk interval following MeHg exposure, the percent mercury as inorganic mercury (Hg++) increased in gill, kidney, and liver, and to a lesser extent in all other tissues except skeletal muscle. (EIS-Deal)
W78-08690

UTILIZATION OF SWINE MANURE IN A POLYCULTURE OF ASIAN AND NORTH AMERICAN FISHES,
Illinois Natural History Survey, Kinmundy.
D. H. Buck, R. J. Baur, and C. R. Rose.
Transactions of the American Fishereis Society, Vol. 107, No. 1, p 216-222, 1978. 6 tab, 16 ref.

Descriptors: *Aquiculture, *Farm wastes, *Carp, *Channel catfish, *Biochemical oxygen demand, *Domestic animals, *Bass, *Dissolved oxygen, *Recycling, Farm lagoons, *Phytoplankton, *Nutrients, *Waste disposal, Freshwater fish, Water quality, Ecosystems, Food chains, Eutrophication, *Chinese Fish Culture System.

Chinese methods of fish culture were evaluated for potential use in animal waste management, pollution control, and the production of protein. Two ponds were stocked with grass carp, silver carp, northern largemouth bass, channel catfish, and the hybrid of bigmouth buffalo female, and black buffalo male. One pond (0.127 hectare) received the total wastes from five growing pigs (about 39 pigs/hectare of water area), the other pond (0.121 hectare) received the wastes from eight pigs (66 pigs/hectare). Two consecutive lots of pigs were fattened during the study. Over a fish-growing period of about 170 days the net increments in fish biomass were 2,971 kg/hectare in the 0.127-hectare pond and 3,834 kg/hectare in the 0.121-hectare pond. A beneficial influence by the fish on water quality was indicated by continuously adequate levels of dissolved oxygen, and final biochemical oxygen demands in the range of 8-12 mg/liter. (EIS-Deal)
W78-08694

TOXICITY AND BIOACCUMULATION OF CADMIUM AND LEAD IN AQUATIC INVERTEBRATES,
Environmental Research Lab.-Duluth, MN.
R. L. Spehar, R. L. Anderson, and J. T. Fiandt.
Environmental Pollution, Vol. 15, p 195-208, 1978. 7 fig, 1 tab, 32 ref.

Descriptors: *Toxicity, *Absorption, *Cadmium, *Lead, *Metals, *Invertebrates, Aquatic animals, Insects, Aquatic insects, Snails, Gastropods, Mayflies, Amphipoda, Aquatic life, Metabolism, Animal physiology, Lethal limit, Heavy metals, Water quality, Mortality, Analytical techniques, Animal behavior, Life cycles, *Bioaccumulation.

Cadmium toxicity and lead toxicity to four species of insects (Pternoarcys dorsata, Hydropsyche betteni, Brachycentrus sp. and Ephemerella sp.), one snail (Physaintegra) and one amphipod (Gammarus pseudolimnaeus) were determined during 28-day exposures. The 28-day LC50 values for cadmium-exposed snails and lead-exposed amphipods were eleven and four times lower than the 7- and 4-day (96 h) values for these metals, respectively. Lowest effect concentrations obtained after 28 days for cadmium-exposed mayflies (Ephemerella sp.) and snails and lead-exposed amphipods were similar to those affecting fish exposed over their complete life cycle in water of similar quality. Lethal threshold concentrations were not observed for species exposed to either metal, indicating that possible effects could occur at lower concentrations during longer exposure periods. Cadmium and lead concentrations in the animals tested generally increased with increasing water concentrations and were up to 30,000 and 9000 times greater than corresponding metal concentrations in the water. (EIS-Klein)
W78-08695

ACUTE TOXICITY OF AMMONIA AND NITRITE TO CUTTHROAT TROUT FRY,
Montana State Univ., Bozeman. Fisheries Bioassay Lab.
R. V. Thurston, and R. C. Russo.
Transactions of the American Fisheries Society, Vol. 107, No. 2, p 361-368, 1978. 6 fig, 3 tab, 35 ref.

Descriptors: *Toxicity, *Salmonids, *Trout, *Cutthroat trout, *Ammonia, *Nitrites, Lethal limit, Fry, Fish physiology, Nitrogen compounds, Bioassay, Rainbow trout, Analytical techniques, Bioaccumulation, Tissue analysis.

The toxicity of ammonia and of nitrite was tested on cutthroat trout (Salmo clarki) fry for periods up to a month in flow-through bioassays. Median lethal concentration (LC50) values for ammonia were 0.5-0.8 (mg/l-NH3) for 96 h and 0.3-0.6 for 36 days. Nitrite LC50 values (mg/l-NO2-N) were 0.5-0.6 for 96 h, and 0.4 for 36 days. Tissues of fish exposed for 29 days to 0.34 mg/l NH3, evidenced degenerative changes in gills, kidneys, and livers. Cutthroat trout fry were comparable to rainbow trout (S. gairdneri) fry in their susceptibility to acute toxicity from aqueous ammonia and nitrite. (EIS-Klein)
W78-08696

TOLERANCES OF FISHES TO DISSOLVED GAS SUPERSATURATION IN DEEP TANK BIOASSAYS,
Battelle, Pacific Northwest Lab., Richland, WA.
D. H. Fickeisen, and J. C. Montgomery.
Transactions of the American Fisheries Society, Vol. 107, No. 2, p 376-381, 1978. 5 fig, 1 tab, 5 ref.

Descriptors: *Toxicity, *Supersaturation, *Fish physiology, *Gases, Mortality, Fish diseases, Freshwater fish, Suckers, Cutthroat trout, Hydrostatic pressure, Compressibility, Water pressure, Water properties, Resistence, Water quality, Bioassay, Sculpins, *Dissolved gases, Mountain whitefish, Largescale sucker, Torrent sculpin, Gas bubble disease.

Four species of fish were tested for tolerance to dissolved atmospheric gas supersaturation in 10-day bioassays. Based on median times to death at four levels of gas saturation, the fish displayed the following increased order of tolerance: mountain whitefish (Prosopium williamsoi) less than cutthroat trout (Salmo clarki) less than largescale sucker (Catostomus machrocheilus) less than torrent sculpin (Cottus rhotheus). Increasing hydrostatic pressure due to water depth reduced the levels of saturation of dissolved gases and increased survival. Torrent sculpins typically developed large bubbles of gas which caused them to float and would contribute indirectly to death. (EIS-Klein)
W78-08697

CHRONIC EFFECTS OF CADMIUM AND ZINC MIXTURES ON FLAGFISH (JORDANELLA FLORIDAE),
Environmental Research Lab., Duluth, MN.
R. L. Spehar, E. N. Leonard, and D. L. DeFoe.
Transactions of the American Fisheries Society, Vol. 107, No. 2, p 354-360, 1978. 2 fig, 2 tab, 26 ref.

Descriptors: *Metals, *Toxicity, *Cadmium, *Zinc, Lake Superior, Freshwater fish, Resistence, Life cycles, Lethal limit, Mode of action, Water quality, Mortality, Laboratory tests, Environmental effects, Bioassay, *Flagfish, *Bioaccumulation, Jordanella floridae, Synergistic effects.

Flagfish were exposed to cadmium and zinc as individual metals and as mixtures (4.3-8.5 micrograms Cd/liter and 73.4-139 micrograms Zn/liter) through one complete life cycle in Lake Superior water (45 mg/liter total hardness). Cadmium and zinc did not act additively at sublethal concentrations when combined as mixtures; however, a joint action of the toxicants was indicated. Effects on survival showed that the toxicity of cadmium and zinc mixtures was little if any greater than the toxicity of zinc alone. Mechanisms of zinc toxicity in this test were similar to those in previous chronic tests of individual metals, indicating that the presence of cadmium did not influence the mode of action of zinc. Comparisons between metal residues in fish exposed to each individual metal or to the metal mixtures showed that the uptake of one metal was not influenced by the presence of the other. (EIS-Klein)
W78-08698

FACTORS AFFECTING METHYL AND INORGANIC MERCURY DYNAMICS IN MUSSELS AND SHRIMP,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
S. W. Fowler, M. Heyraud, and J. La Rosa.
Marine Biology, Vol. 46, p 267-276, 1978. 5 fig, 5 tab, 26 ref.

Descriptors: *Mussels, *Shrimp, *Mercury, *Metals, Bioassay, Radiochemical techniques, Invertebrates, Mollusks, Metabolism, Absorption, Laboratory tests, Benthic fauna, Analytical techniques, *Methyl mercury, *Bioaccumulation, *Tissue analysis, Elimination, Lysmata seticaudata, Mytilus galloprovincialis.

Radiotracer experiments were designed to study the effect of certain factors on the accumulation and loss of methyl mercury in mussels and benthic shrimp. Methyl mercury was accumulated from both food and water to a greater degree than inorganic mercury by both mussels and benthic shrimp. Smaller mussels tended to concentrate more mercury than larger individuals. Greater mercury accumulation and more rapid elimination at higher temperatures was noted for mussels. Methyl mercury residues were eliminated by both species more slowly than those of the inorganic form. Enhanced methyl mercury elimination was noted for the group of mussels maintained in their natural environment as compared with those held in the laboratory. (EIS-Klein)
W78-08699

EFFECTS OF WATER-SOLUBLE OIL FRACTIONS ON METABOLISM, GROWTH AND CARBON BUDGET OF THE SHRIMP CRANGON CRANGON,
Marine Lab., Aberdeen (Scotland)
R. R. C. Edwards.
Marine Biology, Vol 46, p 259-265, 1978. 5 fig, 2 tab, 18 ref.

Descriptors: *Shrimp, *Oil, *Toxicity, *Organic compounds, Invertebrates, Animal physiology, Metabolism, Respiration, Growth rates, Carbon, Water temperature, Mortality, Analytical techniques, Bioassay, *Crangon crangon, *Water-soluble Oil Fractions, Carbon budget, Crude oil, Bioaccumulation.

Juvenile shrimp, Crangon crangon L., were maintained in water-soluble crude oil fractions at 10, 15, and 20C. During chronic exposure to oil fractions, a reduction in respiration and growth rate occurred which was related to strength of the extract. Mortality increased with strength of oil fraction and was highest at 20C. Calculation of carbon budgets indicated that the extract reduced net carbon turnover at each temperature. Physiological consequences resulting from exposure to the oil fraction were discussed. (EIS - Klein)
W78-08700

ARE ALGAE TOXIC TO HONEY BEES,
Agricultural Research Service, Tucson, AZ.
R. J. Barker.
Journal of the Arizona Academy of Science, Vol 12, No 2, p 84-85, June, 1977. 10 ref.

Descriptors: *Bees, *Insect resistance, Cyanophyta, *Algal poisoning, *Algal toxins, Anabaena, Analytical techniques, Testing procedures, Laboratory tests, Arizona, Sonoran Desert.

Previous water studies have attributed deaths of honey bees, Apis mellifera L., to poisoning by toxic algae. Under controlled conditions, this laboratory experiment evaluated the effect of feeding certain forms of algae to honey bees. Findings indicated A. flos-aquae toxin and plant scum, from pond water in the Sonoran Desert containing other algae, did not harm bees even when they were fed 10,000 mg/kg. Tolerance shown by bees to toxins of A. flos-aquae might permit bees to transport algal toxins from ponds to the honey comb, possibly leading to the accumulation of algal toxins in honey. (Jewkes-Arizona)
W78-08746

THE OSMOTIC CONCENTRATION OF THE BLOOD PLASMA OF PLAICE (PLEURONECTES PLATESSA) FROM THREE HABITATS OF DIFFERENT SALINITY,
Delta Inst. for Hydrobiological Research, Yerseke (Netherlands).
A. G. Vlasblom, K. F. Vaas, and W. Rozing.
Netherlands Journal of Sea Research, Vol. 11, No. 2, 1977, p 168-193, 4 fig, 5 tab, 11 ref.

Descriptors: Environmental effects, *Salinity, Temperature, Fish, Sea water, Brackish water, Size, Salt tolerance, *Plaice, Lakes, *Netherlands, Lake Greveling(Neth), Lake Veere(Neth), Water pollution effects.

Osmotic concentration of the blood plasma of plaice from Lake Greveling and Lake Veere were compared with those of plaice from the coastal North Sea from August 1971 to December 1973. Salinity was highest in the North Sea and lowest in Lake Veere. Plaice were found to be hyposmotic to the surrounding water with the osmotic concentration usually decreasing and never increasing with the length of the plaice. The influence of temperature on the total and the electrolyte osmotic concentration was stronger in plaice from the North Sea than in those from the lakes. This resulted in seasonal fluctuation in plasma osmotic vaues being more pronounced in the sea even though temperatures in the sea fluctuated less than in the lakes. The interaction between temperature and salinity changed with length of the plaice with the interaction being strongest in fish from the North Sea and weakest in fish from Lake Veere. It was concluded that plaice that have lived longest in an unusual environment of abnormal salinity show the weakest reaction to changes in environmental factors. (Chilton-ORNL)
W78-08760

THE EFFECTS OF PRECIPITATION ON AQUATIC AND TERRESTRIAL ECOSYSTEMS: A PROPOSED PRECIPITATION CHEMISTRY NETWORK, DEPT. OF ENVIRONMENTAL SCIENCES.
Virginia Univ., Charlottesville.
J. N. Galloway, and E. B. Cowling.
Journal of the Air Pollution Control Association Vol. 28, No. 3, March 1978, p 229-235, 5 fig, 4 tab, 41 ref.

Descriptors: *Environmental effects, Air pollution, *Air pollution effects, Aquatic environment, *Precipitation(Atmospheric), *Chemistry of Precipitation, Measurement, Management, Networks, Pollutant identification.

The major purpose is to describe the changing chemistry of precipitation and its effects of terrestrial and aquatic ecosystems. The paper discusses the concept of sensitive areas and the need to identify them on a regional basis. It is emphasized that, due to the changing chemistry of precipitation, there is a need for a network of precipitation measuring stations in the U.S. and Canada to provide information about changes in the deposition of beneficial nutrient elements as well as potentially injurious substances. (Chilton-ORNL)
W78-08762

EFFECTS OF CORNSTARCH AND DEXTROSE ON OYSTERS,
Virginia Inst. of Marine Science. Gloucester Point.
K. W. Turgeon, and D. S. Haven.
The Veliger, Vol. 20, No. 4, April 1978, p 352-358, 5 tab, 27 ref.

Descriptors: Environmental effects, *Foods, *Oysters, Management, Market value, Water pollution effects, Food supplement, *Cornstarch, *Dextrose.

The purposes were to define the minimum quantity of particulate carbohydrate (in the form of partially hydrolyzed cornstarch) necessary to produce a measurable increase in glycogen content, tissue weight, shell height, underwater shell weight and total volume of oysters; to determine if the effect of starch varied with season; to eliminate some of the confusion concerning the uptake and utilization of dextrose. Results showed that effects of carbohydrate supplements on glycogen levels varied with season. Comparison of cornstarch and dextrose results showed that cornstarch was the better supplemental food and this effect was most noticeable in the fall. Cornstarch had no influence on shell height, underwater shell weight and total volume at any season. It was concluded that the influence of cornstarch as a supplement for oysters is limited to glycogen content and tissue size with the major influence being on glycogen levels. (Chilton-ORNL)
W78-08767

EFFECTS OF DREDGED SPOILS ON SELECTED MICROBIAL ACTIVITIES IN LAKE COLUMN SIMULATORS,
Waterloo Univ. (Ontario). Dept. of Biology.
E. A. Smith, C. I. Mayfield, and P. T. S. Wong.
Water, Air, and Soil Pollution, Vol. 8, 1977, p 417-428, 1 fig, 2 tab, 37 ref.

Descriptors: Environmental effects, Water pollution, *Dredging, Turbidity, *Water pollution effects, Aquatic microbiology, Aquatic environments, *Microbial activity.

Dredged spoils (DS) were added to lake column simulators as slurries 5 days of each week for 9 week at loading rates of 0.33, 3.3, and 33 g/day. The continued addition of DS to the epilimnetic regions of the lake column simulators had a stimulatory effect on microbial activities and the stimulation was approximately proportional to the loading rates of DS. The influence of DS on P32-P04 uptake and on C14-acetate mineralization in water was most pronounced immediately following loading. A three-fold increase in heterotrophic activity during a 1 h incubation at 20C was seen following addition at the 33 g/day loading rate. DS resulted in an increase in levels of N2-fixation. Results suggest that the introduction of DS into a water mass will produce an overall short-term stimulation of microbial activities but that DS may have a significant influence on the movement on C, N, and P in aquatic ecosystems receiving continuous loadings. (Chilton-ORNL)
W78-08768

FOOD CONCENTRATION AND STOCKING DENSITY EFFECTS ON SURVIVAL AND GROWTH OF LABORATORY-REARED LARVAE OF BAY ANCHOVY ANCHOA MITCHILLI AND LINED SOLE ACHIRUS LINEATUS,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
For primary bibliographic entry see Field 2L.
W78-08769

THE EFFECTS OF SAND MOVEMENT ON INTERTIDAL SEAWEEDS AND SELECTED INVERTEBRATES AT BOUND ROCK, NEW HAMPSHIRE, USA,
New Hampshire Univ., Durham. Dept. of Botany and Plant Pathology; and New Hampshire Univ., Durham. Jackson Estuarine Lab.
M. A. Daly, and A. C. Mathieson.
Marine Biology, Vol. 43, No. 1, 1977, p 45-55, 11 fig, 2 tab, 37 ref.

Descriptors: *Environmental effects, *Sediments, *Sands, *Sand bars, Movement, Geomorphology, Intertidal areas, Invertebrates, Aquatic plants, Sediment distribution, *New Hampshire, Seaweeds.

Four types of sand variations were observed at Bound Rock: diurnal, neap-spring, storm, and a major summer sand inundation. The distribution and abundance of the major benthic plants and animals showed pronounced fluctuations which were interrelated with sand fluctuations of the area. Mytilus edulis, Balanus balanoides and Porphyra umbilicalis were at their lower limits at the time of highest summer sand elevations. Opportunistic annuals and perennial psammophytic species dominated highly abraded rock surfaces in the lower intertidal zone. It was concluded that the low species diversity of seaweeds at Bound Rock was due to unstable environmental conditions and a limited number of habitats. Psammophytic species showed a variety of morphological and reproductive adaptations to sandy habitats such as regeneration of upright fronds from their bases and incomplete alternation of generations. (Chilton-ORNL)
W78-08774

SOME ASPECTS OF THE PHYSIOLOGY OF ARENICOLA MARINA (POLYCHAETA) EXPOSED TO FLUCTUATING SALINITIES,
Natural Environment Research Council, Bangor (Wales). Marine Invertebrate Biology Unit.
S. E. Shumway, and J. Davenport.
Journal of the Marine Biological Association of the United Kingdom, Vol. 57, No. 4, November 1977, p 907-924, 17 fig, 3 tab, 21 ref.

Descriptors: Environmental effects, *Salinity, Invertebrates, Animal physiology, Hydrogen ion concentration, *Arenicola marina, *Lugworms, Worms.

Laboratory tests showed that lugworms react to dilution of water by becoming inactive and compressing themselves at the bottom of their burrow. The overlying water is tested periodically by the organism and normal activity is resumed when the salinity returns to the initial concentration. The results indicate that A. marina is an osmotic and ionic conformer, but that it can control the concentration of its body fluids by the means described. The coelomic fluid pH of both burrowed and non-burrowed lugworms exposed to gradual and abrupt salinity profiles showed an inverse relationship to the salinity change. (Chilton-ORNL)
W78-08778

ECOLOGICAL EXPERIMENTS WITH SARGASSUM MUTICUM,
Glasgow Univ. (Scotland). Dept. of Botany.
T. A. Norton.
Journal of the Marine Biological Association of the United Kingdom, Vol. 57, No. 1, February 1977, p 33-43, 2 fig, 7 tab, 23 ref.

Descriptors: *Environmental effects, Temperature, Salinity, *Growth rate, *Marine plants, Drying, Distribution, Resistance, *Sargassum muticum, Ecology, *Japanese seaweed, *San Juan Island(Wash), *Washington.

An investigation was made of the distribution of S. muticum in the San Juan Islands, its tolerance to extreme environmental conditions, and the resilience of its recovery after exposure to sublethal stresses. It was found that upward extension of the seaward into the littoral zone is limited by its susceptibility to desiccation and insolation in summer and to frosting in winter. Sublethal exposures to these conditions tends to retard the subsequent growth of the plants and the degree of retardation was found to increase with severity and duration of exposure. Low salinities and temperatures also tended to reduce growth rate. (Chilton-ORNL)
W78-08779

HYDROGEN PRODUCTION BY ANABAENA CYLINDRICA: EFFECTS OF VARYING AMMONIUM AND FERRIC IONS, PH, AND LIGHT,
California Univ., Livermore. Lawrence Livermore Lab.
T. W. Jeffries, H. Timourian, and R. L. Ward.
Applied and Environmental Microbiology, Vol. 35, No. 4, April 1978, p 704-710, 4 fig, 24 ref.

Descriptors: Environmental effects, Physiological ecology, Plant physiology, Algae, Nutrition, *Hydrogen ion concentration, *Cyanophyta, Ammonium, *Ions, *Light, Photosynthesis, Biophotolysis, *Anabaena cylindrica.

The objectives of this study were to determine optimal nutritional and physiological conditions necessary for continuous, stable hydrogen production by blue-green algae. Cultures sparged with argon gas produced hydrogen continuously for 30 days under limited light conditions and for 18 days under elevated light conditions in the absence of exogenous nitrogen. The addition of ammonium was found to suppress hydrogen production. The effects of iron and pH on hydrogen production were investigated and it was found that high iron concentrations increased the rate of hydrogen production with the most constant increase in the rate being obtained in the presence of elevated iron under alkaline conditions. (Chilton-ORNL)
W78-08780

ROLE OF SEDIMENT IN THE PERSISTENCE OF ENTEROVIRUSES IN THE ESTUARINE ENVIRONMENT.
Baylor Coll of Medicine, Houston, TX. Dept. of Virology and Epidemiology.
E. M. Smith, C. P. Gerba, and J. L. Melnick.
Applied and Environmental Microbiology, Vol 35, No. 4, April 1978, p 685-689, 4 fig, 1 tab, 24 ref.

Descriptors: Environmental effects, *Water pollution effects, Sewage, *Viruses, *Sediments, Estuarine environment.

Untreated sediment and estuarine water were used in this investigation into the survival of echovirus 1, coxsackieviruses B3 and A9, and poliovirus 1. Viruses were found to survive for prolonged periods in sediments but not in the overlaying waters. This high affinity of marine sediment for virus adsorption and the detection of virus in sediments near sewage outfalls suggest the importance of sediment in viral pollution. The major factors suggested to influence virus survival are temperature, salinity, pH, microbial population, and chemical agents. (Chilton-ORNL)
W78-08781

THE RISE AND FALL OF MIREX,
Canada Centre for Inland Waters, Burlington (Ontario).
K. L. Kaiser.
Environmental Science and Technology, Vol. 12, No. 5, May 1978, p 520-528, 3 fig, 4 tab, 27 ref.

Descriptors: Environmental effects, *Water pollution effects, *Pesticides, Aquatic environment, Food chains, Absorption, *Toxicity, *Persistence, Lakes, *Lake Ontario, *Niagara River, *St. Lawrence River, Legislation, *Mirex.

The use of mirex and findings on the persistence and toxicity of this pesticide are reviewed. Studies showed that mirex contaminated the biota of the entire Lake Ontario. Results of sediment studies indicated that the Niagara River was a major carrier of mirex into Lake Ontario. Mirex was also reported in fish from the upper St. Lawrence River. Indications are that mirex is moving up the food chain in Lake Ontario. In an aquatic model ecosystem it was demonstrated that when mirex is removed from the exposure to potentially degrading conditions to lake sediments, it is likely to persist indefinitely. New control legislation has been passed which it is hoped will prevent the recurrence of an environmental invasion by persistent, toxic compounds having long-lasting and hazardous effects on the environment. (Chilton-ORNL)
W78-08782

AQUATIC ENVIRONMENTAL SAFETY ASSESSMENT FOR A NONPHOSPHATE DETERGENT BUILDER,
Proctor and Gamble Co., Cincinnati, OH. Environmental Safety Dept.
A. W. Maki, and K. J. Macek.
Environmental Science and Technology, Vol. 12, No. 5, May 1978, p 573-580, 4 fig, 6 tab, 29 ref.

Descriptors: Environmental effects, *Water pollution effects, *Safety, Assessments, *Detergents, Phosphates, Aquatic life.

The purpose was to develop an aquatic safety assessment program for the evaluation of risk to aquatic organisms associated with the use of Type-A zeolite in detergent formulations. Type-A zeolite is empirically similar to naturally occurring clay materials. Experiments showed that this zeolite is nontoxic at projected environmental levels to aquatic species representing three major trophic levels of freshwater and marine aquatic communities and does not contribute to the eutrophication potential of surface waters. The material is efficiently removed from wastewater through conventional waste treatment processes. It was concluded that zeolite used as nonphosphate builder for heavy duty detergents would have no significant environmental impact. (Chilton-ORNL)
W78-08783

PHOSPHORUS FERTILIZATION OF SUNFISH PONDS,
Auburn Univ., AL. Dept. of Fisheries and Allied Aquacultures.
F. Lichtkoppler, and C. E. Boyd.
Transactions of the American Fisheries Society, Vol. 106, No. 6, 1977, p 634-636, 2 tab, 5 ref.

Descriptors: Environmental effects, *Fertilization, Crop response, Fish, Fish farming, Stocking, *Sunfishes, Ponds, *Phosphorus.

This study was designed to compare the effect on sunfish production of 4.5 and of 9 kg/hectare/application of P205 using seven replication per treatment. Results suggested that phosphorus fertilization rates for ponds on wooded watersheds may be reduced from 9 to 4.5 kg/hectare/application of P205 without significant reduction in sunfish production. However, the 9 kg/hectare/application rate gave numerically greater means (not statistically significant) in both studies. Therefore, it is suggested that heavily fished woodland ponds stocked with bass and sunfish should still be fertilized at the 9 kg/hectare/application rate. (Chilton-ORNL)
W78-08785

AGRICULTURAL BY-PRODUCTS AS SUPPLEMENTAL FEED FOR CRAYFISH, PROCAMBARUS CLARKII,
Louisiana State Univ., Baton Rouge. Fisheries Section.
J. C. Goyert, and J. W. Avault, Jr.
Transactions of the American Fisheries Society, Vol. 106, No. 6, 1977, p 629-633, 3 tab, 14 ref.

Descriptors: *Fish farming, Foods, *Nutrients, Agriculture, *Byproducts, *Growth rates, Sexual maturity, *Crayfish, Louisiana, *Aerobic conditions, Monitoring, *Carbon:Nitrogen ratios.

This study was undertaken to determine the value of certain agricultural plant by-products as nutrient sources for crayfish culture and to determine whether their nutritional utility is related C:N ratios. Two studies were conducted, the first having a duration of 65 days and the second a duration of 48 days. In both studies, reasonable growth and survival was seen but sexual maturation occurred at a small size. Significant differences in both length and weight increases were found with different foods. Ranking of feeds according to crayfish growth from highest to lowest was dried sweet potato vines, sweet potato trimmings, aged rice stubble, aged rye hay, aged soybean stalks, and aged sugarcane stalks. There were pronounced changes in the C:N ratios of decomposing plant by-products. Except for dried sugarcane stalks and tree leaves, all by-products attained C:N ratios of less than 17:1 in a 3-month period of storage in water. (Chilton-ORNL)
W78-08786

5D. Waste Treatment Processes

EFFLUENT MONITORING PROCEDURES: METALS ANALYSIS STAFF GUIDE FOR CONDUCTING THE COURSE,
National Training and Operational Technology Center, Cincinnati, OH.
For primary bibliographic entry see Field 5A.
W78-08240

EVALUATION OF THE STANDARD SAMPLING TECHNIQUE FOR SUSPENDED SOLIDS,
Environmental Protection Agency, Kansas City, KS. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5A.
W78-08242

HYDRAULIC DESIGN FOR COMBINED SEWER DIVERSION,
Worcester Polytechnic Inst., MA. Alden Research Lab.
For primary bibliographic entry see Field 8B.
W78-08269

DENITRIFICATION USING THIOSULFATE AND SULFIDE,
Cornell Univ., Ithaca, NY. Dept. of Environmental Engineering.
J. J. Bisogni, Jr., and C. T. Driscoll, Jr.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. EE4, p 593-604, August 1977. 3 fig, 6 tab, 10 ref.

Descriptors: *Waste water treatment, *Anaerobic processes, *Bacteria, *Denitrification, *Sulfur, Water pollution, Sanitary engineering, Equations.

Autotropic denitrification using enriched cultures of Thiobacillus denitrificans was investigated. Thiosulfate and sulfide were used as electron donors in laboratory scale denitrification systems. The stoichiometric ratio of the amount of sulfur electron source (sulfide or thiosulfate) needed to reduce a given amount of nitrate was determined. This ratio (called the consumptive ratio, Cr) is concluded to be approximately 1.35 on an electron equivalent basis. The systems were tested under dynamic loading conditions to assess overall operational stability. In all experiments, denitrification proceeded efficiently. It is concluded that autotropic denitrification using sulfide or thiosulfate has potential as a wastewater treatment process. (Graf-Cornell)
W78-08301

SALT REMOVAL EFFICIENCIES ON LAND DISPOSAL OF SWINE WASTE,
Alcorn State Univ., Lorman, MS.
H. E. Grier, G. C. Gupta, and S. C. Tiwari.
Journal of the Environmental Division, Proceedings of the American Society of Civil Engineers, Vol 103, No EE4, p 551-556, August 1977. 7 fig, 8 tab, 7 ref.

Descriptors: *Waste water treatment, *Agricultural wastes, *Overloads, *Nitrates, *Waste recycling, *Effluents, Waste disposal, Land fill, Salts, Suspended solids, Removal, Ammonia, Biochemical oxygen demand, Chlorides, Efficiencies.

Swine waste aerobic lagoon effluent was sprinkled overland and the runoff water was collected. Both the waste effluent and the runoff water were analyzed for nitrate, ammonia, chloride, suspended solids, BOD, and specific conductance. Removal efficiency of nitrate dropped from 62% to 32%, on prolonged disposal of swine waste effluent, in 6 months. Data for suspended solids and specific conductance support these results for nitrate removal efficiency. Removal efficiencies for ammonia and chloride were higher and showed a very small decrease with time. BOD removal efficiency was 95% throughout the 6-month period of the study. The system showed signs of 'overloading' for nitrate removal but not for BOD removal. (Graf-Cornell)
W78-08302

VIRUS SAMPLING IN WASTEWATER--FIELD EXPERIENCES,
Los Angeles County Sanitation District, Whittier, CA.
For primary bibliographic entry see Field 5A.
W78-08303

FACILITIES PLANNING SUMMARY, TITLE II, FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5B.
W78-08314

SUSPENDED SOLIDS LIMITATIONS FOR WASTEWATER TREATMENT PONDS.
Environmental Protection Agency, Washington, DC.

For primary bibliographic entry see Field 5G.
W78-08325

DREDGED MATERIAL DENSIFICATION AND TREATMENT OF CONTAMINATED DREDGED MATERIAL,
Army Engineers Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5E.
W78-08374

GROWTH OF WATER HYACINTHS IN TREATED SEWAGE EFFLUENT,
Iowa State Univ., Ames. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 5G.
W78-08410

RAINFALL ANALYSIS FOR THE DESIGN OF STORM SEWERS IN BOMBAY,
Associated Industrial Consultants, Bombay (India).
For primary bibliographic entry see Field 2B.
W78-08433

EXPERIMENTAL STUDY OF DISCHARGE SIPHONS OF PUMPS IN THE PROJECT OF THE URBAN SEWER SYSTEM OF MONTREAL (ETUDE EXPERIMENTALE DES SIPHONS DE DECHARGE DES POMPES DANS LE CADRE DU PROJET D'ASSAINISSEMENT DE LA COMMUNAUTE URBAINE DE MONTREAL),
Service d'Assainissement des Eaux, Montreal (Quebec).
For primary bibliographic entry see Field 8C.
W78-08434

HUMAN PATHOGENS AS POTENTIAL HEALTH HAZARDS IN THE REUSE OF WATER,
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark). Dept. of Virology and Immunology.
For primary bibliographic entry see Field 5F.
W78-08435

HYPOCHLORITE GENERATION AT A WATER POLLUTION CONTROL PLANT,
Amherst Town Engineer's Office, NY.
R. Doan, Jr., and A. S. Haimes.
Public Works, Vol. 109, No. 1, p 48-51, January, 1978. 2 fig, 1 tab.

Descriptors: *Disinfection, *Sodium compounds, *Chlorination, *Ion exchange, *Electro-chemistry, Anodes, Cathodes, Tertiary treatment, Treatment facilities, Brines, Generators, Waste water treatment, Municipal wastes.

Two hypochlorite generators producing chlorine for disinfection of effluent have been included in the design of the 24 mgd waste water treatment plant in Amherst, New York. The Amherst plant will provide secondary and tertiary treatment, as well as postchlorination and prechlorination of effluent. Two 5,000 1g/day Ionics Inc. Cloromat hypochlorite generators will produce an 8% sodium hypochlorite solution from rock salt and brine. As 2,900-3,900 lbs chlorine/day are required by the Amherst plant, in-plant generation of sodium hypochlorite was considered safer than transporting chlorine to the plant. Production of the 8% solution costs a total of $3,345,100, while the required chlorine would cost $5,880,900 if purchased. The Cloromat system, consisting of electrochemical cells containing ion-selective membranes, generates chlorine gas from sodium chloride brine in a titanium-coated anode compartment. The mild steel cathode generates hydroxide ions from water and mixes them with sodium ions from the anode to form caustic solution and hydrogen. Chlorine gas is removed from the brine and hydrogen from the caustic solution by gas-liquid separators. These residuals are reacted to generate sodium hypochlorite which is stored in two 6,000 gal storage tanks. The 100 gpm of cooling water required by the Cloromat system will be supplied by a cooling tower for make-up water. (Lisk-FIRL)
W78-08436

MAINTAINING DIGESTER BALANCE MAKES FOR ENERGY CONSERVATION.
Public Works, Vol. 109, No. 2, p 82-83, February, 1978.

Descriptors: *Methane, *Gases, *Sludge digestion, *Power system operation, *Activated sludge, Treatment facilities, Methane bacteria, Sodium compounds, Lime, Alkalinity, Waste water treatment, Municipal wastes.

A method for utilizing sludge digester gas to operate equipment has been developed for the Bay Park waste water treatment plant on Long Island, New York. The 60 mgd treatment facility generates enough methane to furnish the energy requirements of the plant at an estimated power savings of $430,000 over a two-yr period. Odors generated by the activated sludge process with diffused aeration are collected for ozonation treatment. Optimum conditions for methane gas production in the digestors are created by maintaining pH above 6.8, volatile acids below 280 mg/liter and alkalinity above 2,500 mg/liter. The daily dry sludge load of 14 tons generates 500,000 cu ft of digester gas which is stored in a Horton gas sphere. The digester gas is maintained between 92-94 F by engine cooling water that is passed through heat exchangers. An imbalance in optimum conditions for methane production is rectified with the addition of 2,000-2,500 lbs of sodium bicarbonate and a small addition of lime to the grease pit; the grease pit is pumped and cleaned before its contents are discharged to the digester. Enough digester gas is produced daily to operate the three 1,300 hp and one 700 hp diesel turbines which supply plant power. (Lisk-FIRL)
W78-08437

PERFORMANCE OF CIRCULAR FINAL CLARIFIERS AT AN ACTIVATED SLUDGE PLANT,
Metropolitan Sanitary District of Greater Chicago, IL.
W. L. Munch, and J. A. Fitzpatrick.
Journal Water Pollution Control Federation, Vol. 50, No. 2, p 265-276, February, 1978. 10 fig, 2 tab, 10 ref.

Descriptors: *Activated sludge, *Settling basins, *Hydraulic models, *Solid wastes, *Separation techniques, Suspended solids, Hydraulics, Effluent streams, Performance, Waste water treatment, Municipal wastes.

The performance of a 38 m-diam circular center-feed clarifier was evaluated under varying conditions of hydraulic and solids loading at an activated sludge treatment facility in Chicago, Illinois. Limiting the effluent flow to 0.66 cu m/sec with a 30% return rate allowed a maximum solids loading rate for efficient clarification of 146 kg/sq m/day at a mixed liquor concentration of 2,500 mg/liter. Higher flow rates were possible when the mixed liquor content was decreased. A higher solids loading rate was accommodated by the clarifier when the hydraulic loading rate was maintained below 0.83 cu m/sec, verifying the dependence of solids loading on hydraulic load. An increase in the thickness of the sludge blanket, occurring at hydraulic loading in excess of 0.83 cu m/sec at a 30% return, threatened the solids separation efficiency of the clarifier. Sludge blanket level, solids settleability, and hydraulic loading reportedly had a greater impact on clarifier solids separation performance than shock hydraulic loading. The actual maximum solids loading rate was significantly lower than the theoretical maximum. (Lisk-FIRL)
W78-08438

SLUDGES AND SIDESTREAMS GO HAND-IN-HAND,
Camp Dresser and McKee Inc., Walnut Creek, CA.
A. A. Kalinske.
Water and Wastes Engineering, Vol. 15, No. 2, p 25-27, February, 1978. 1 ref.

Descriptors: *Effluent streams, *Pollutants, *Sludge treatment, *Byproducts, *Stabilization, Anaerobic conditions, Aerobic treatment, Sludge digestion, Lime, Incineration, Drying, Landfills, Return flow, Chlorinated hydrocarbon pesticides, Electrolysis, Electrodialysis, Reverse osmosis, Ion exchange, Waste water treatment, Municipal wastes.

The characteristics of waste water sidestreams generated by sludge stabilization, thermal disposal, drying, composting, landfilling, land application, and advanced waste water treatment are discussed. Stabilization of sludge by aerobic, anaerobic, lime, or heat treatment can produce a waste stream with BOD concentrations ranging from 1,200-10,000 mg/liter, phosphorus levels from 150-700 mg/liter, and ammonia-nitrogen contents from 400-1,000 mg/liter. Thermal destruction of sludge, which is conditioned with polymers or lime and ferric chloride to reduce soluble BOD, produces gaseous emissions which are scrubbed with water. These sidestreams, containing volatile organics, are treated with chemical coagulation and settlement before discharge. Leachate from drying beds contains high concentrations of BOD and ammonia which should be prevented from percolating into aquifers or washing out with surface run-off. Composting of sludge can result in a sidestream of waste water resulting from storm water runoff; total enclosure of compost sites and collection of runoff are recommended. Pathogens, heavy metals, and chlorinated hydrocarbons are present in leacheates from landfill disposal of sewage and industrial sludges. Sewage sludge applied to land contains toxic metals and organics that are solubilized by rainwater which carries the toxins into surface and groundwater. Waste water sidestreams are generated by advanced treatment such as carbon adsorption, electrodialysis, and ion exchange or reverse osmosis. (Lisk-FIRL)
W78-08439

CLEVELAND PUSHES TO MEET STRICT EFFLUENT LIMITATIONS,
Cleveland Regional Sewer District, OH.
For primary bibliographic entry see Field 5G.
W78-08440

OZONE PLANT IMPROVES EFFICIENCY AND ECONOMY OF WASTEWATER TREATMENT,
Ozonair Corp., San Francisco, CA.
K. Stopka.
Water and Sewage Works, Vol. 125, No. 4, p 54-59, April, 1978. 4 fig, 9 tab.

Descriptors: *Ozone, *Disinfection, *Design criteria, *Oxidation, *Aeration, Waste water treatment, Absorption, Odor, Municipal wastes, Industrial wastes, Oxygenation, Dissolved oxygen, Sludge treatment, Water treatment, Organic wastes.

A three-month field testing program was used to evaluate ozone concentrations and dosages in waste water treatment. The study also examined the feasibility of using ozone in small quantities as a source of nascent oxygen in aeration. Air enriched with 5 mg/liter ozone was applied to effluent in a contact vessel for 15 min of equalization and 30 min of treatment time. The oxygen supplied by the ozone stimulated the growth of aerobic organisms and suppressed the growth of anaerobes.

When the ozone dosage was increased to 10 mg/liter, the enhanced bioflocculation effect was replaced by sterilization. The higher solubility of ozone/air mixtures was reported by reduced air requirements, energy expenditures, and contact times to below those required for aeration or pure oxygenation. Ozone treatment at a concentration of 2% by weight was considered to be effective for deodorization in municipal and industrial waste treatment. Criteria were recommended for the design of an ozone plant, covering such topics as air preparation, ozone-producing electrode specifications, air moisture, and ozone contractor performance. (Lisk-FIRL)
W78-08441

A NOVEL CLARIFIER FOR DILUTE PROCESS STREAMS,
P. J. Flynn, and J. D. Boadway.
Industrial Water Engineering, Vol. 15, No. 1, p 19-22, January-February 1978. 7 fig, 1 tab, 3 ref.

Descriptors: *Centrifugation, *Separation techniques, *Filtration, *Design data, Equipment, Tertiary treatment, Suspended solids, Industrial wastes, Effluent streams, Waste water treatment, Municipal wastes.

The Vortex Clarifier, an automatic batch centrifuge developed by Queen's University, Kingston, Ontario, and Bird Machine Co., Inc., was found effective in reducing suspended solids of 1,000 ppm or less in municipal and industrial waste streams. The Vortex Clarifier separates the waste stream which is moved axially between two rotating cylinders. The settling vanes and bowl, which rotate at the same speed, create a fixed vortex in the liquid passing through a separator for particulate migration toward the bowl wall. The settling vanes enhance the removal of fine particles, reducing the internal turbidity in the liquid vortex. Sufficient accumulation of particulate matter enacts the solids discharge cycle. The Vortex Clarifier reduced suspended solids in a mixed municipal and industrial waste stream at a 12 mgd municipal treatment plant by 80%. Suspended solids levels in the filtrate from two vacuum filters were reduced by 97%. Polishing of secondary clarifier overflow by the centrifuge unit reduced suspended solids from 15-24 ppm to 5-8 ppm. Suspended solids in an industrial waste stream containing talc and water were reduced by 97% in the clarifier and by 91% for the settling tank effluent. (Lisk-FIRL)
W78-08442

REMOVAL OF HEAVY METALS VIA OZONATION,
Syracuse Univ., NY.
R. L. Shambaugh, and P. B. Melnyk.
Journal Water Pollution Control Federation, Vol. 50, No. 1, p 113-121, January, 1978. 10 fig, 2 tab, 27 ref, 1 append.

Descriptors: *Mathematical models, *Analytical techniques, *Heavy metals, *Ozone, *Filtration, Chemical precipitation, Manganese, Lead, Nickel, Zinc, Cobalt, Oxidation, Waste water treatment, Municipal wastes.

Rate constants were calculated for the second-order reaction of aqueous ozone with free and complexed heavy metals. The rate constants were dependent upon ozone concentrations determined by ozone transfer between gas and liquid, the reaction of ozone with free or complexed metals, and the degradation of ozone in the aqueous solution with respect to pH. Ozonation of heavy metals was examined for ethylenediaminetetracetic acid (EDTA)-complexed manganese, cadmium, nickel, and lead, and uncomplexed lead, manganese, zinc, nickel, cobalt, and barium. Ozone contact times of 10 min were sufficient to break down the EDTA-complexed metals. Uncomplexed metals with high oxidation states were rendered less soluble after 1 min of ozonation. The second-order rate constant for the ozonation of uncomplexed lead and other metals was estimated to be greater than 1 billion cu cm/mole-sec. The reaction rate of ozone with the EDTA-complexed metals was an order of magnitude faster than for ozonation of the EDTA alone. (Lisk-FIRL)
W78-08444

ENHANCEMENT OF PHOSPHORUS REMOVAL THROUGH IRON COGULATION FOLLOWING LIME PRECIPITATION,
Consoer, Townsend and Associates, Chicago, IL.
P. V. Cavagnaro, S. W. Work, E. R. Bennett, and K. D. Linstedt.
Journal Water Pollution Control Federation, Vol. 50, No. 1, p 95-100, January, 1978. 5 fig, 2 tab, 8 ref.

Descriptors: *Nutrient removal, *Chemical precipitation, *Lime, *Iron, *Phosphorus, Pilot plants, Flocculation, Coagulation, Sludge treatment, Waste water treatment, Municipal wastes.

Lime and iron coagulant additions to waste water were tested as a means of removing phosphorus and reducing sludge and lime quantities. Lime was added to unchlorinated secondary effluent in doses of 50, 100, 150, 200, 300, and 400 mg/liter, followed by ferric chloride in doses of 0, 1.0, 2.1, 4.2, 6.2, and 8.5 mg/liter. The treatment process consisted of rapid mixing with the coagulant conditioners, followed by flocculation and settling. Particulate phosphorus was completely removed at all of the lime dosage rates used in conjunction with iron 360 mg/liter lime without ferric chloride additions reduced total phosphorus to 0.7 mg/liter. The same total phosphorus concentration was achieved with 180 mg/liter lime when 4.1 mg/liter ferric chloride was added. The quantity of sludge generated from lime treatment without iron was 2.5 tons/million gal which was reduced to 1.2 tons/million gal with iron coagulations. The lime and ferric chloride additions significantly improved suspended solids removal and had a slight effect on COD and bacteria reductions. (Lisk-FIRL)
W78-08445

AN OVERVIEW OF LAND TREATMENT FROM CASE STUDIES OF EXISTING SYSTEMS,
Cold Regions Research and Engineering, Lab., Hanover, NH.
For primary bibliographic entry see Field 5E.
W78-08446

50 YEARS' EXPERIENCE OF SLUDGE DEWATERING.
For primary bibliographic entry see Field 5E.
W78-08447

A NEW METHOD OF WASTEWATER TREATMENT: INTERMITTENT SUBMERGED BIOOXIDATION, (IN JAPANESE),
Yonetsuru Shuzo Co. Ltd, Yamagata (Japan).
M. Nagatani, H. Nakagawa, and Y. Nunokawa.
Hakko Kogaku, Society of Fermentation Technology, Osaka University, Japan. Vol. 56, No. 2, p 127-132, 1978. 5 fig, 1 tab, 2 ref.

Descriptors: *Oxidation, *Biological treatment, *Plastics, *Chemical oxygen demand, *Submergence, *Aeration, Porous media, Nutrient removal, Volumetric analysis, Respiration, Oxygen demand, Microorganisms, Waste water treatment, Municipal wastes.

An intermittent submerged biooxidation system utilizing microbial slime attached to palstic plates which are alternately submerged ans exposed to air was tested for use in small-scale waste water treatment plants. The plastic plates, with a total surface area of 0.5 sq m available for microbial slime, were mounted in two 5 liter vessels which were operated in 24 hr batch cycles. Waste water introduced into the first tank was drained to the second tank and then back to the first at 15 min intervals. The microorganisms thus received alternate supplies of nutrients and oxygen. The COD concentration of waste water initially containing less than 21 g/sq m/day was reduced by 90% with the biooxidation system. The oxygen uptake rate of the microbial slime was measured as 22.2 g/sq m/day by a membrane oxygen sensor after air within an empty vessel was circulated at 1.3 liter/min. The oxygen uptake rate of a slime-free wet surface using the same apparatus was measured as 7.4 g/sq m/day by rthe sulfide oxidation technique, verifying higher oxygen absorption rates due to the presence of microbial slime in the intermittent submerged biooxidation system. (Lisk-FIRL)
W78-08448

RESULTS OF INVESTIGATIONS OF OPERATION TECHNIQUES, OPERATIONAL SAFETY, TECHNOLOGY AND ECONOMICS OF THE BIOREACTOR FOR SEWAGE SLUDGE ROTTING (ERGEBNISSE DER UNTERSUCHUNGEN UEBER BETRIEBSTECHNIK, BETRIEBASSICHERHEIT, TECHNOLOGIE UND WIRTSCHAFTLICHKEIT AM BIOREAKTOR ZUR ABWASSERSCHLAMMVERROTTUNG),
Bayerisches Landesamt fuer Umweltschutz Munich (West Germany).
For primary bibliographic entry see Field 5E.
W78-08449

THE OPERATION OF THE ZIMPRO THERMAL CONDITIONING WITH AIR SLUDGE PLANT AT KWA DABEKA (CLERMONT) SEWAGE WORKS,
G. F. Antoni.
Water Pollution Control, Vol. 77, No. 1, p 75-78, 1978. 1 fig, 4 tab.

Descriptors: *Treatment plants, *Sludge treatment, *Dewatering, *Thermal radiation, *Cost analysis, Vacuum drying, Sludge disposal, Filtration, Biochemical oxygen demand, Chemical oxygen demand, Waste water treatment, Municipal wastes.

A cost and performance analysis was presented for the Zimpro thermal sludge conditioning system installed at the Kwa Kabeka sewage treatment plant in Natla, South Africa. The Kwa Kabeka facility, with a planned capacity of 18,200 cu m/day, produced raw sludge containing 3-6% solids; sludge liquors and vacuum filter filtrate were returned to the head of the works. The Zimpro system passes settled raw sludge through idsintegrators the heat exchangers and a themal reactor. After decompression, sludge is pumped to a catalyst furnace; oxidized sludge is transported to a vacuum filter which separates the sludge cake from the supernatant liquor. The Zimpro system cost about 400,000 rands less than conventional sludge treatment processes and required less land. The filtration properties of the sludge were also improved by thermal oxidation. Capital costs for the sludge dewatering plant were 440,600 rands, 62,200 rands more than estimated. Annual operating costs of the Zimpro system without sludge dewatering and supernatant liqour treatment were 17,051 rands, at a unit cost of 3.79 rands/kiloliter raw sludge. Thermally oxidized sludge liquors contained an estimated 6,180 mg/liter BOD and 12,360 mg/liter COD at a pH of 4-9. Operational problems encountered during 1975, the first year of operation of the Zimpro system, included collapse of the gearbox in the oxidized sludge stirrer mechanism, grit abrasion of the piston seals and sleeves of the high-pressure pumps, and line blockage due to large amouts of rags and other materials in the influent to the raw sludge tanks. (Lisk-FIRL)
W78-08450

ABATEMENT OF ODOR IN SEWAGE WORKS--DETERMINED IN HEIDELBERG

(GERUCHSBEKAEMPFUNG IN KOMPOST-WERKEN AM BEISPIEL HEIDELBERG),
Technische Univ., Berlin (West Germany). Fachgebiet Abfallwirtschaft.
B. Jaeger, and J. Jager.
Muell and Abfall, Vol. 10, No. 2, p 48-54, 1978. 6 fig, 3 tab, 11 ref.

Descriptors: *Odor, *Air pollution, *Sludge treatment, *Biological treatment, *Municipal wastes, Filters, Filtration, Organic compounds, Costs, Sewage treatment, Waste water treatment.

The Heidelberg refuse and sewage composting plant generated malodorous emissions which were a nuisance to the residents of the community located 400 m from the plant. Feasibility and cost studies of various alternatives for odor abatement revealed the distinct advantages of odor control by means of compost bed filters with surface areas of 200 sq m. The compost filters proved to be efficient and reliable. The overall treatment efficiency relative to concentrations of organic carbon before and after filtration was 93%. Removal efficiencies for specific emission components were: 100% for ethanol, diacetyl, and acetone; 72% for limonene; and about 50% for other compounds. (Takacs-FIRL)
W78-08451

THE EURO-MATIC BIO-DRUM PROCESS,
European Plastic Machinery Mfg., Copenhagen (Denmark).
L. Holmberg.
Tribune du CEBEDEAU, Vol. 30, No. 409, p 437-441, December, 1977. 6 fig, 1 tab.

Descriptors: *Biological treatment, *Activated sludge, *Biological membranes, *Trickling filters, *Plastics, Construction materials, Rotational flow, Treatment plants, Sludge treatment, Biochemical oxygen demand, Separation techniques, Waste water treatment, Municipal wastes.

The design of the Euromatic Bio-Drum incorporates principleks of both the trickling filter and the rotating contact filter for biological waste water treatment. The Bio-Drum utilizes plastic balls held together in the shape of a drum by a metal net; the drum is free floating because of the low specific gravity of the plastic media. Containers built into the periphery of the drums lift waste water out of the aeration tank, as well as trap air which is taken down into the tank and bubbled through the drums. The drums can be adjusted to varying levels of waste water and speeds of rotation; the system provides 100% moistening of the biological filter media. BOD removal efficiencies by the microbial film supported on the plastic balls in the Bio-Drum have been about 85% and as high as 95% when sludge is returned to the system. Activated sludge flocs are easily separated from the water; 100% settling has been achieved within 30 min. The Bio-drum removes 3-4 kg BOD/kilowatt-hour, compared to 1 kg BOD/kilowatt-hour for conventional activated sludge systems. Two systems are in operation in Denmark; the Bio-Drum is also being tested for recirculating fish breeding pond water. (Lisk-FIRL)
W78-08452

HOLDENHURST: OXYGEN BOOST TO SEASIDE WORKS,
Wessex Water Authority, Bristol (England). Avon and Dorset Recovery Div.
J. T. Rees.
Surveyor, Vol. 151, No. 4471, p 17-20, February, 1978.

Descriptors: *Oxidation, *Activated sludge, *Dissolved oxygen, *Biochemical oxygen demand, *Nitrification, Ammonia, Suspended solids, Oxygen demand, Settling basins, Waste water treatment, Municipal wastes.

A Vitrox oxygen injection unit was installed in the Holdenhurst sewage treatment plant, under the jurisdiction of England's Wessex Water Authority, to improve nitrification in the effluent. The plant was upgraded from a capacity of 13.6 million liters/day to 27.2 million liters/day with provisions for an additional 6.0 million liters/day to accommodate higher sewage loads during the summer months. After the waste water was degritted and pulverized, it flowed through six settlement tanks to two activated sludge plants; a 12,000 cu m/day portion received further treatment by three nitrifying filters. The final effluent should have contained 15 mg/liter BOD, 20 mg/liter suspended solids, and 20 mg/liter ammonia-nitrogen. BOD levels were found to be higher than anticipated because of incomplete oxidation of nitrogenous material; dissolved oxygen levels were below the minimum 4% in the aeration channels. A fourth nitrifying filter as installed and the first aeration unit was limited to carbonaceous oxidation. The second aeration unit was upgraded with the Vitrox system injecting 4 tons oxygen/day. Mixed liquor suspended solids were increased to 3,000 mg/liter in the aeration units; final effluent was pumped into six storm tanks with a combined capacity of 6,820 cu m to eliminate the effects of denitrification. Three additional Vitrox units were subsequently installed to upgrade the first aeration unit. Odor problems arising from the plant were abated by Vitrox injection of 0.75 tons of oxygen/day into degritted influent. (Lisk-FIRL)
W78-08453

STUDY OF THE INFLUENCE OF ACTIVATORS ON THE PURIFICATION EFFICIENCY OF SEPTIC TANKS (ETUDE DE L'ACTION DES ACTIVATEURS SUR L'EFFICACITE D'EPURATION DES FOSSES SEPTIQUES),
SETRIC, Toulouse (France).
R. Chelle, and F. Bazerque.
Techniques et Sciences Municipales - l'Eau, Vol. 73, No. 1, p 43-47, January, 1978. 5 fig, 1 tab, 2 ref.

Descriptors: *Septic tanks, *Microorganisms, *Biodegradation, *Sewage bacteria, *Nutrient removal, Bacteria, Biological treatment, Ammonia, Municipal wastes, Waste water treatment.

Organic and inorganic additives were tested for their ability to improve septic tank sewage treatment. Biodegradable activators which can be assimilated by bacteria and stimulate microorganism growth were found to improve the performance of septic tanks, both at the initial startup phase and at restart after accidental poisoning of the septic tank microflora. The activators, containing concentrated bacteria and nutrients, shortened the length of time required to achieve a high degree of purification in terms of COD removal. Mineral additives increased the suspended solids content of the septic effluent without increasing the degradation of organic matter. Bacteria seeding was especially effective for temperatures below 15C where the growth rate of the bacteria in the additive far surpassed that of naturally occurring sewage bacteria. (Takacs-FIRL)
W78-08454

IS CHLORINE THE BEST DISINFECTANT.
For primary bibliographic entry see Field 5F.
W78-08455

CAN CALIFORNIA COPE WITH ITS MOUNTING SLUDGE VOLUMES,
California Office of Water Recycling, Sacramento.
For primary bibliographic entry see Field 5E.
W78-08456

THE OXFAM SANITATION UNIT,
Oxfam, Oxford (England).
J. Howard, and B. Lloyd.
Proceedings of the Royal Society of London Series B, Vol. 199, No. 1134, p 179-182, 1977. 1 fig.

Descriptors: *Treatment facilities, *Anaerobic conditions, *Percolation, *Filtration, *Salmonella, Hospitals, Coliforms, Aerobic treatment, Sewage bacteria, Septic tanks, Waste water treatment, Municipal wastes, *Oxfam sanitation unit.

The patented Oxfam sanitation unit is a three-stage plastic waste water treatment plant which does not require a power source and reduces pathogenic organisms. Each unit, servicing 500 people, contains: a latrine area, partially constructed from the unit's wooden shipping crate; nylon-reinforced butyl rubber tanks for sewage containment and anaerobic treatment; and an aerobic percolating filter composed of 50-75 mm locally obtained pieces of brick or stone. The filtrate from the process drains into a trench or drain. The Oxfam unit was tested with wastes from the Cholera Research Laboratories in Dacca, Bangladesh. Chlorea, coliform and salmonella populations were reduced to .01 of their original counts. Ascaris and Trichuris ova were undetected in 100 ml of effluent. The treatment unit, with an estimated life span of 5-10 yrs, costs about 5 pounds sterling per capita. (Lisk-FIRL)
W78-08457

S. HANTS' SEWAGE GIANT.
For primary bibliographic entry see Field 5E.
W78-08458

A CHLOROFORM PROBLEM AT GREAT WARFORD AND ITS SOLUTION,
Allott and Lomax, Manchester (England).
C. Lumb, D. Brown, and M. K. V. Bottomley.
Water Pollution Control, Vol. 76, No. 11, p 459-467, 1977. 3 fig, 6 ref.

Descriptors: *Organic compounds, *Aeration, *Sludge digestion, *Aerobic treatment, *Drying, Equipment, Chemical wastes, Waste dilution, Waste water treatment, Sludge treatment, Municipal wastes.

Air-stripping of sewage sludge was employed at the 2,950 cu m/day Great Warford municipal sewage treatment plant in England to remove chloroform originating from pharmaceutical plant wastes. Concentrations of chloroform averaged 2.7 mg/liter in wet sludge and 47 mg/kg in the dry sludge, arising from a discharge of 3 liters/day chloroform from the pharmaceutical laboratory. To improve sludge digestion, inhibited by the presence of chloroform, it was necessary to limit the concentration of chloroform in the dry sludge to 5-10 mg/kg. Laboratory experiments on air-stripping of chloroform indicated that an aeration intensity of 20 cu m/sq m/hr at 9C for periods of 6.8-8.7 hr would reduce the wet sludge chloroform content of 0.2 mg/liter, yielding a dry sludge concentration of 5 mg/kg with a 4% dry solids content. The final sludge stripping system employed 15 coarse bubble air jet diffusers, with 600 jets mounted in the base of a 4.2 sq m tank operated on a batch basis. The stripped sludge was transported to a digester feed tank for chloroform monitoring before it was fed to the digester. Stripped sludges with chloroform concentrations in excess of 0.3 mg/liter, which would contribute to a dry sludge content of 7.5 mg/kg, were returned to the air-stripping unit. (Lisk-FIRL)
W78-08459

FOR THE SAKE OF A FOOTPATH 240,000 (POUNDS STERLING) WAS LOST.
Water Services, Vol. 81, No. 975, p 295-298, May, 1977.

Descriptors: *Treatment facilities, *Biological treatment, *Filtration, *Storm water, *Sludge treatment, Foundations, Piles(Foundations), Biochemical oxygen demand, Suspended solids, Waste water treatment, Municipal wastes.

Because of unstable ground conditions, the municipal waste water treatment facility in Saffron Walden, Essex, England, was constructed on piled foundations. The 5,160 cu m/day capacity plant required 670 piles at 29-30 m in length for support in the peat and alluvial soil; excavation was restricted to 4 m because of groundwater levels. The treatment system includes screening and degritting, primary settlement, biological filtration, secondary settlement, and effluent polishing with microstrainers. In the winter, BOD and suspended solids levels are reduced to 20 mg/liter and 30 mg/liter, respectively, and to 15 mg/liter and 20 mg/liter, respectively, during the summer when rivers have low flows. The sludge is thickened and stored for final treatment at a regional facility. Storm water is stored in tanks with a total capacity of 900 cu m and released for full treatment when flows decrease. During overflow conditions, the storm water flows over grassland for filtering and oxidation. Up to 100 mg/liter suspended solids are permitted in storm water discharged to the River Slade. THe sewage flows by gravity to the site of the old treatment works from which it is pumped to the new plant. (Lisk-FIRL)
W78-08460

SIERRAS BOAST MOST MODERN TREATMENT PLANT,
A. W. Allen.
Western Construction, Vol. 53, No. 4, p 22-24, April, 1978.

Descriptors: *Treatment facilities, *Design data, *Settling basins, *Chemical precipitation, *Polymers, Lime, Carbon dioxide, Oxidation, Sludge treatment, Dewatering, Equipment, Flocculation, Waste water treatment, Activated carbon, Adsorption, Filtration, Municipal wastes.

A $20 million tertiary treatment plant in California will treat 4.85 mgd of wastes from the Lake Tahoe Basin area, Truckee, and several other areas. The effluent receives conventional secondary treatment by primary and secondary settling with oxidation. Phosphorus and some suspended solids are then precipitated with lime, followed by polymer dosage in rapix-mix and flocculation tanks. The effluent is then injected with carbon dioxide gas in recarbonation basins for calcium removal and pH adjustment. The treated effluent is pumped to two ballast tanks with a total volume of 1.2 million gallons before the wastes are filtered, adsorbed on activated carbon towers, and stripped of ammonia on ion exchange beds and three ammonia removal and recovery modules for ammonium sulfate fertilizer production. The effluent is discharged into a series of subsurface ditches for percolation through the glacial soil into the Truckee River. Sludge is thickened, dewatered, conditioned with lime and polymers, filtered on a horizontal press operated by 3 variable speed pumps, and disposed of in a landfill. Carbon dioxide is generated on-site by compressed gas from the digester boilers and by carbon dioxide stripping during oxygenation of the wastes; supplementary liquid carbon dioxide is stored on-site. Oxygen is also generated on-side by Union Carbide's Pressure-Swing Adsorption process. The plant design includes enclosed piping and electrical corridors which provide passage from one building to another and a complete laboratory. (Lisk-FIRL)
W78-08461

ANIMAL DISEASE HAZARDS OF SLUDGE DISPOSAL TO LAND: OCCURRENCE OF PATHOGENIC ORGANISMS,
Northumbrian Water Authority, Gosforth (England).
For primary bibliographic entry see Field 5C.
W78-08463

AMMONIA VOLATILIZATION FROM SEWAGE SLUDGE APPLIED IN THE FIELD,
Guelph Univ., (Ontario). Dept. of Land Resources Science.
For primary bibliographic entry see Field 5E.
W78-08465

A UNIFIED THEORY OF FILAMENTOUS ACTIVATED SLUDGE BULKING,
California Univ., Berkeley. Div. of Hydraulic and Sanitary Engineering.
M. Sezgin, D. Jenkins, and D. S. Parker.
Journal Water Pollution Control Federation, Vol. 50, No. 2, p 362-381, February, 1978. 16 fig, 3 tab, 36 ref.

Descriptors: *Activated sludge, *Flocculation, *Microorganisms, *Bulk density, *Dissolved oxygen, Aeration, Chlorine, Toxins, Physical properties, Waste water treatment, Analytical techniques, Municipal wastes.

The formation of filamentous microorganisms is examined as a factor in bulking during the activated sludge process. The outgrowth of filamentous microorganisms from activated sludge floc is greater than zoogleal microorganism growth under particular conditions within the floc interior conducive to filament growth. Lower floc interior dissolved oxygen levels, from 1.3-1.8 mg/liter in an air system, are more conducive to filament growth than higher dissolved oxygen levels of 6.7-8.0 mg/liter. A minimum sludge floc interior dissolved oxygen level of 2.0 mg/kiter, maintained automatically, is considered optimum for sludge settleability. Filaments longer than 10,000,000 microns/ml can increase reflocculation time, 60-min compact volume, and the sludge volume index. A filament length of 10,000,000 microns/ml is considered the dividing point between a bulking and a non-bulking sludge. Activated sludge bulking was reportedly controlled by toxic chemicals, such as chlorine and hydrogen peroxide. Waste character and strength, reactor design, aeration system and temperature affect the critical dissolved oxygen concentration which limits sludge bulking. (Lisk-FIRL)
W78-08466

CRITICAL CONSIDERATIONS ON THE DETERMINATION OF EXTRACTABLE SUBSTANCES IN POLLUTED WATERS (CONSIDERAZIONI CRITICHE SULLA DETERMINAZIONE DI SOSTANZE ESTRAIBILI IN ACQUE INQUINATE),
Florence Univ. (Italy). Inst. of Analytical Chemistry.
For primary bibliographic entry see Field 5A.
W78-08468

THE EFFECT OF QUICK FREEZING ON THE CONTENT OF ORGANIC WATER CAPACITY SUBSTANCES (DIE WIRKUNG DES TIEFGEFRIERENS AUF DEN GEHALT AN ORGANISCHEN WASSERINHALTSTOFFEN),
For primary bibliographic entry see Field 5A.
W78-08469

PROFILE-ANALYSIS OF POLYCYCLIC AROMATIC HYDROCARBONS IN SEWAGE SLUDGE BY GAS CHROMATOGRAPHY (GASCHROMATOGRAPHISCHE PROFILANALYSE DER POLYCYCLISCHEN AROMATISCHEN KOHLENWASSERSTOFFE IN KLARSCHLAMMPROBEN),
Biochemisches Inst. fuer Unweltearcinogene, Ahrensburg (West Germany).
For primary bibliographic entry see Field 5A.
W78-08470

PHOSPHATE FERTILIZING EFFECT OF SLUDGE FROM DOMESTIC SEWAGE PURIFICATION WITH FHOSPHATE PRECIPITATION (ZUR PHOSPHATDUENGEWIRKUNG VON SCHLAEMMEN AUS DER KOMMUNALEN ABWASSERREINIGUNG MIT PHOSPHATFAELLUNG),
Hoechst A.G., Huerth/Knapsack (West Germany).
For primary bibliographic entry see Field 5E.
W78-08471

PERSISTENCE OF ENTEROVIRUSES IN SEWAGE SLUDGE,
Ontario Ministry of Health, Toronto. Lab. Services Branch.
For primary bibliographic entry see Field 5A.
W78-08472

RELATION BETWEEN DEHYDRABILITY AND PROPERTIES OF SEWAGE SLUDGE (REPORT I) (GESUIODEI NO SHOSEIJO TO DASSEUISEI NI TSUITE),
For primary bibliographic entry see Field 5A.
W78-08473

THE DISTRIBUTION OF HEAVY METALS IN ANAEROBIC DIGESTION,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
T. D. Hayes.
Journal Water Pollution Control Federation, Vol 50, No 1, p 61-72, January, 1978. 15 fig, 5 tab, 21 ref.

Descriptors: *Heavy metals, *Anaerobic digestion, *Toxicity, *Sewage sludge, *Model studies, Biomass, nickel, Copper, Lead, Chromium, Zinc, Cadmium, Solubility, Distillation, Waste water treatment, Municipal wastes.

The distribution of heavy metals in anaerobic digesters was investigated using three bench-scale anaerobic digesters fed with sewage containing varying concentrations of heavy metals. Nitrate salts of chromium, copper, nickel, zinc, cadmium, and lead and dichromate were fed to the digesters in concentrations ranging from 5-15,000 mg/liter by step or pulse feed applications over a period of 10 days. Sludge samples taken during the digestion process were separated into soluble, precipitated, extracellular, and intracellular fractions for heavy metal analysis. Decreasing gas generation, methane concentrations, and organic acids accumulation were monitored as indicators of anaerobic digestion disruption by heavy metals. The toxicity impact of the heavy metals on anerobic digestion followed the relationships: nickel > copper > lead > chromium > zinc, with no toxic impact observed for the cadmium doses. Heavy metal concentrations in the digester were distributed between the in-soluble or precipitated fraction and the intracellular or biomass fraction, with little of the metals evident in the extracellular fraction. Levels of heavy metals which would produce inhibition and toxicity during anerobic digestion were calculated. (Lisk-FIRL)
W78-08474

MICROSCOPIC OBSERVATION OF ACTIVATED SLUDGE APPLIED TO THE MONITORING OF TREATMENT PLANTS (L'OBSERVATION MICROSCOPIQUES DES BOUES ACTIVEES APPLIQUE A LA SURVEILLANCE DES INSTALLATIONS D'EPURATION: TECHNIQUE D'ETUDE INTERPRETATION),
Montpellier-2 Univ. (France). Lab. de Genie Chimique, Traitement et Epuration des Eaux.
For primary bibliographic entry see Field 5A.
W78-08475

TEEPOL AND TRITON MEDIA FOR THE ENUMERATION OF ESCHERICHIA COLI BY MEMBRANE FILTRATION,
Dundee Univ. (Scotland). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.

W78-08476

COMPARISON OF ADSORPTION ELUTION METHODS FOR CONCENTRATION AND DETECTION OF VIRUSES IN WATER,
Hadassah Medical School, Jerusalem (Israel). Environmental Health Lab.
For primary bibliographic entry see Field 5A.
W78-08477

DETERMINATION OF TOCL BY ENRICHMENT ON POWDERED ACTIVATED CARBON AND FLOCCULATION (UNTERSCHUNGEN ZUR BESTIMMUNG DE ORGANISCH GEBUNDENEN CHLORS MIT HILFE EINES NEUARTIGEN ANREICHERUNGSVERFAHREN),
For primary bibliographic entry see Field 5A.
W78-08478

STABILITY AND FLOCCULATION OF COLLOIDAL PARTICLES--PART 1,
J. Gregory.
Effluent and Water Treatment Journal, Vol. 17, No. 10, p 515, 517, 519-521, October, 1977. 5 fig, 15 ref.

Descriptors: *Colloids, *Flocculation, *Mathematical models, *Coagulation, Analytical techniques, Kinetics, Chemical precipitation, Solubility, Sedimentation rates, Shear, Waste water treatment.

Mathematical models were developed to describe the stability and flocculation kinetics of colloidal particles. Flocculation of colloidal particles occurs by either Brownian motion (perikinetic flocculation) or induced velocity gradients (orthokinetic flocculation). Both types of flocculation are rate dependent upon the collision rate which expresses the maximum flocculation rate. This rate can be described as a function of colloidal concentration, decreasing with time, and rate constant, indicating that perikinetic flocculation is a second-order process. Integration of the flocculation rate equation can provide particulate concentrations at a specific time. The rate of orthokinetic flocculation can be expressed as a function of shear rate, spherical particle diameter, and initial concentration of the particles. Perikinetic flocculation of spherical particles is described with an equation using Boltzmann's constant, absolute temperature, and water viscosity. A comparison of the orthokinetic and perikinetic rates indicates that orthokinetic flocculation is more significant for particles above 1 micron in diameter and for higher shear rates. Hydrophilic colloid flocculation occurs when water solubility is altered by temperature, or salt or ion additions. Hydrophobic colloids aggregate when the energy barrier formed by an excess electrical repulsion is reduced or removed. The zeta potential of the particle and solution can be measured by electrokinetic techniques. (Lisk-FIRL)
W78-08479

KINETIC AND EQUILIBRIUM ASPECTS OF FLOC COAGULATION,
Vanderbilt Univ., Nashville, TN. Dept. of Chemistry.
D. J. Wilson.
Separation and Science Technology, Vol. 13, No. 1, p 25-37, 1978. 2 fig, 4 tab, 13 ref.

Descriptors: *Kinetics, *Equilibrium, *Flocculation, *Colloids, *Mathematical models, Stability, Electrolytes, Coagulation, Ionization, Diffusion, Waste water treatment.

The kinetics of colloidal flocculation were studied under various conditions of surface potential, ionic strength, particle size, temperature, and particle concentration. Mathematical models to describe flocculation were developed by modification of the Gouy-Chapman model of the electric double layer. The potential agglomeration of particles is calculated according to the height of the barriers created by the potential energy generated from dispersion forces and electrical forces of the particles. Flocculati
W78-08480

STRATIFICATION IN LABORATORY SIMULATIONS OF SHALLOW STABILIZATION PONDS,
Indian Inst. of Tech., Kanpur, Dept. of Civil Engineering.
S. D. Bokil, and G. D. Agrawal.
Water Research, Vol. 11, No. 12, p 1025-1030, 1977. 5 fig, 3 tab, 14 ref.

Descriptors: *Laboratory tests, *Analytical techniques, *Settling basins, *Alkalinity, *Biochemical oxygen demand, Algae, Aerobic treatment, Anaerobic conditions, Waste water treatment, Municipal wastes.

Laboratory simulations were used to calculate the biochemical stratification occurring in shallow waste water stabilization ponds. Light intensity in the laboratory stabilization ponds, with depths of 53.5 and 35.5 cm, was maintained at a constant value of 60 cal/sq cm/day; two organic feed rates were employed. Biochemical stratification occurred in both laboratory ponds; stratification consisted of a small lower anaerobic bottom layer and an upper aerobic layer whose depth size remained constant under variations in hydraulic loading and pond depth. Low alkalinity and BOD levels were apparent in the upper stratum; high alkalinity and BOD were found in the bottom layer. The rate of oxygen decrease in the upper layer was a function of depth in the absence of agitation and averaged 0.09 mg/liter/cm. Algae concentrations increased functionally with decreasing detention time. Light attenuation at the depth where algal concentrations were insignificant was 96% of the surface light intensity. (Lisk-FIRL)
W78-08481

CONTROL TESTS AND KINETICS OF ACTIVATED SLUDGE PROCESS,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical and Environmental Engineering.
L. K. Wang, C. P. C. Poon, and M. H. Wang.
Water, Air, and Soil Pollution, Vol. 8, No. 3, p 315-351, August, 1977. 16 fig, 1 tab, 31 ref.

Descriptors: *Activated sludge, *Kinetics, *Mathematical models, *Analytical techniques, *Oxygen demand, Biochemical oxygen demand, *Chemical oxygen demand, Aeration, Biodegradation, Nitrification, Denitrification, Sewage sludge, Waste water treatment, Municipal wastes.

Mathematical models described the kinetics of the activated sludge process in complete-mix reactors with and without sludge recycle and in plug-flow reactors with sludge recycle. The process parameters of biodegradability and sludge acclimation were analyzed as a function of oxygen uptake rate based on dissolved oxygen concentrations. Definitions and standard evaluations of solids, sludge settling, sludge blanket, sludge units and substrate utilization were presented. Equations were developed to describe the interrelationships between hydraulic retention time, volumetric loading, sludge production, sludge wasting, and recirculation ratio for the three types of activated sludge reactors. The ratio of BOD to COD could be replaced with equations for calculating the BOD:total organic carbon ratio; methods of establishing 5-day BOD, initial BOD of the influent, ultimate BOD, residual BOD and BOD at any given time period were presented. Mathematical models were also developed for calculating treatment efficiency, yield and endogenous respiration coefficients, growth rate, and sludge volume index. An energy-assimilation reaction model was designed to assess the nitrification and denitrification capacity of a system; an analytical procedure for calculating maximum nitrifying and denitrifying abilities was outlined. (Lisk-FIRL)
W78-08482

SIGNIFICANT CORRELATION EXISTS BETWEEN DESIGN TECHNIQUES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
J. H. Sherrard.
Water and Wastes Engineering, Vol. 15, No. 1, p 50-52, January, 1978. 5 fig, 1 tab.

Descriptors: Analytical techniques, *Mathematical models, *Biochemical oxygen demand, *Nitrogen, *Design criteria, Activated sludge, Aeration, Suspended solids, Waste water treatment, Municipal wastes.

Correlations between rational and empirical design techniques of the activated sludge process are investigated with mathematical models. Rational techniques are based on microbial growth and degradation balanced with the utilization of materials to supply values for mean cell residence time, biological solids retention time, or sludge age. Empirical techniques utilize functions of hydraulic retention time, alone or in conjunction with oxygen uptake, BOD, and the food-to-microorganism ratio. Total Kjeldahl nitrogen (TKN) is a function of BOD, uptake rates of BOD or TKN, microorganism constant yield coefficient, influent flow rate, and influent and effluent BOD or TKN levels. Mean cell residence time is related to aeration basin volume, mixed liquor suspended solids, and flow rate; the food-to-microorganism ratio follows the ratio of flow rate and BOD or TKN concentrations to basin volume and mixed liquor suspended solids. When the mathematical models were applied to a 10 mgd treatment plant, BOD was metabolized at higher cell residence times with higher mixed liquor suspended solids. The food-to-microorganism ratio became smaller while nitrification occurred with increasing cell residence time and larger amounts of TKN. (Lisk-FIRL)
W78-08483

INAPPLICABILITY OF BATCH KINETIC DATA TO ANALYSIS OF SOIL TREATMENT SYSTEMS,
Kennedy Engineers, Inc., San Francisco, CA.
For primary bibliographic entry see Field 5E.
W78-08484

THE BEHAVIOR OF A POORLY DEGRADABLE MODEL SUBSTANCE DURING BIOLOGICAL PURIFICATION (VERHALTEN EINER SCHWER ABBAUBAREN MODELLSUBSTANZ BEI DER BIOLOGISCHEN REINIGUNG),
Technische Hochschule, Darmstadt (West Germany). Inst. fuer Wasserversorgung, Abwasserbeseitigung und Raumplanung.
I. Pedrag.
GWF-Wasser/Abwasser, Vol 119, No 3, p 127-134, 1978. 12 fig, 1 tab, 15 ref.

Descriptors: *Model studies, *Biological treatment, *Biodegradation, *Aeration, *Sludge treatment, Analytical techniques, Activated sludge, Organic wastes, Microorganisms, Degradation, Waste water treatment.

Pentaerythritol was used as a model substance to study the behavior of substances which are not generally amenable to biological waste water treatment. Persistent substances are broken down by slow growing microorganisms which may not have sufficient time to develop in conventional aeration basins. These substances can be more efficiently handled by increasing the age of the activated sludge. This can be achieved by subdividing the biological treatment into two stages. The first stage is operated under high sludge loading conditions. The easily degradable substances are

removed in this stage and some of the more persistent substances are converted by the microorganisms into more easily removed intermediates. The latter, along with the intact persistent substances, are removed in the second stage by microorganisms which have aged under low sludge loading conditions. The overall efficiency of the two-stage aeration system is equivalent to that of a conventional one-stage aeration system is equivalent to that of a conventional one-stage basin. The model studies with pentaerythritol demonstrate that hardly any degradation occurs during the first 2.5 days, after which pentaerythritol removal increases sharply until the 8th day. (Takacs-FIRL)
W78-08485

THE STABILITY OF SUSPENDED PARTICLES IN FLOCCULATION PROCESSES IN WATER AND WASTE WATER (DIE STABILITAET VON SUSPENDIERTEN FESTSTOFFEN BEI FLOKKUNGSPROZESSEN IN WASSER UND ABWASSER),
U. Neis.
Zeitschrift fuer Wasser- und Abwasserforschung, Vol 10, No 6, p 183-192, 1977. 11 fig, 3 tab, 26 ref.

Descriptors: *Flocculation, *Chemical precipitation, *Suspended solids, *Polyelectrolytes, *Aqueous solutions, Silica, Illite, Montmorillonite, Kaolinite, Clay minerals, Salts, Model studies, Waste water treatment, Municipal wastes.

The impact of flocculation and precipitation on the kinetic behavior of aqueous suspensions containing silica, aluminum oxide, kaolinite, illite, monmorillonite, and bacillus cereus was investigated with particle count techniques. Flocculation rates varied for the suspensions of silica, aluminum hydroxide, and clays when simple or hydrolized salts and polyelectrolytes were employed as aggregating agents. Aggregation rates increased while flocs remained intact when the mean velocity gradient was increased to 100/sec. Under optimal concentration ranges of 3.1 million to 2.1 billion particles/ml, variations in hydrodynamic parameters did not affect the destabilizing efficiency of the flocculants. When aluminum salt was used as a precipitant rather than a flocculant, the aggregation of silica in aqueous suspensions was more successful. (Lisk-FIRL)
W78-08486

UNDERFLOW RATE AND CONTROL OF AN ACTIVATED SLUDGE PROCESS,
Hoff-Weston Associates, Cleveland, OH.
M. W. Schaffner, and W. O. Pipes.
Journal Water Pollution Control Federation, Vol 50, No 1, p 20-30, January, 1978. 4 fig, 4 tab, 18 ref.

Descriptors: *Mathematical models, *Sludge treatment, *Settling velocity, *Suspended solids, *Model studies, Settling basins, Data collections, Analytical techniques, Waste water treatment, Municipal wastes.

The limitation of the underflow solids concentration by the area of the settling tank was quantified with mathematical models relating batch settling velocity to solids concentrations. A logarithmic formula, based on Dick and Young's theory of continuous sludge thickening, empirically related the initial settling velocity in batch settling tests, related the hypothetical settling velocity at an infinite solids concentration and the maximum batch solids flux to the initial solids concentration. When the equations were applied to data from batch settling tests conducted over a 1-mo period at a treatment plant, the empirical formula under estimated the underflow solids concentration while the reciprocal model over-estimated the concentration. The underflow suspended solids in the batch settling tests also exceeded the values calculated from the sludge volume index by six-fold. The solids loading on the settling tank was always greater than the solids flux. (Lisk-FIRL)
W78-08487

REMOVAL OF DICHLORAMINE AND AMMONIA BY GRANULAR CARBON,
Tennessee Valley Authority, Chattanooga.
B. R. Kim, V. L. Snoeyink, and R. A. Schmitz.
Journal Water Pollution Control Federation, Vol. 50, No. 1, p 122-133January, 1978. 10 fig, 2 tab, 17 ref.

Descriptors: *Activated carbon, *Chlorine, *Chlorides, *Mathematical models, *Ammonia, Model studies, Adsorption, Chemical reactions, Nitrogen, Chlorination, Kinetics, Waste water treatment, Municipal wastes.

Mathematical models were derived for the removal of dichloramine and ammonia on activated carbon batch and packed bed reactors. Temperature, concentration, and particle size were monitored in closed batch experiment; pore diffusion coefficients were calculated from this data. The coefficients were used to solve an algebraic expression, obtained from the removal rate of dichloramine from bulk fluid on carbon, as a function of the average mass of dichloramine reacted with time for a unit weight of carbon. The data obtained from the packed bed models was applicable in the design and prediction of performance of activated carbon beds. Units employing different carbon types than these experiments required additional batch tests to ensure the accuracy of the mathematical models. The packed beds did not achieve a steady state condition; reaction rates decreased as surface oxides accumulated on the packed bed media. (Lisk-FIRL)
W78-08488

THE INFLUENCE OF PH AND ORGANIC LOADING ON THE FILAMENTATOUS BULKING OF ACTIVATED SLUDGE,
Toyama Coll. of Tech. (Japan). Dept. of Sanitary Engineering.
M. Yasuda.
Transactions of the Japan Society of Civil Engineers, Vol. 8, p 131-132, 1976. 5 fig, 1 tab.

Descriptors: *Sphaerotilus, *Activated sludge, *Bulk density, *Organic loading, *Hydrogen ion concentration, Chemical oxygen demand, Suspended solids, Temperature, Model studies, Waste water treatment, Municipal wastes.

The growth of Sphaerotilus, an organism contributing to filamentatous sludge bulking, in activated sludge was measured with respect to variations in pH, COD, temperature,, and organic loading during laboratory experiments. The temperature of the 5 liter aeration tank and the 1.5 liter settling tank ranged from 18.5-29.4C with an organic loading of 0.24 g COD/g volatile suspended solids/day and a hydraulic loading of 0.57 g COD/liter/day. Sphaerotilus growth increased when the pH of the aeration tank effluent was raised above pH 6; the organic and hydraulic loading rates did not significantly affect Sphaerotilus growth. When pH was varied from 6-9 with an organic loading of 0.30 g COD/liter/day, Sphaerotilus growth was stimulated. Above this pH range Sphaerotilus growth was not apparent; loading rates did not affect growth in the high pH ranges. (Lisk-FIRL)
W78-08489

INFECTIOUS DISEASE HAZARDS OF LAND-SPREADING SEWAGE WASTES,
Agricultural Research Service, Beltsville, MD. Biological Waste Management and Soil Nitrogen Lab.; and Agricultural Research Service, Beltsville, MD. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5C.
W78-08490

PROBLEMS AND TECHNIQUES FOR THE AERATION SYSTEMS IN SEWAGE WORKS AND SURFACE WATERS--EXPERIENCE WITH INSTREAM AERATION AND OXYGEN MONITORING IN THE RIVER RUHR,
Ruhrverband, Essen (West Germany).
For primary bibliographic entry see Field 5G.
W78-08495

CHLORINATION: ASSESSING ITS IMPACT,
For primary bibliographic entry see Field 5C.
W78-08498

1984 IS APPROACHING--WHAT DOES IT MEAN TO THE WASTE-WATER SERVICE,
Thames Water Authority, London (England). Metropolitan Public Health Div.
A. M. Crossley.
Water Services, Vol. 81, No. 978, p 475-476, August, 1977.

Descriptors: *Computers, *Instrumentation, *Measurement, *Equipment, *Dissolved oxygen, Sludge digestion, Methane, Pumping plants, Flowmeters, Waste water treatment, Treatment facilities, Municipal wastes.

Future trends in municipal waste water treatment facilities are predicted. Treatment facilities will reportedly be automatically controlled and operated by a main computer. Log sheets and records will be maintained by the computer for read-out on a visual display unit or on tape. The computer will control plant maintenance schedules as well as security and personnel matters. Magnetic or ultrasonic flowmeters and level transmitters will monitor waste water and sludge flow. Floats and electrodes in pumping stations will be replaced by upstream level meters; pumping operations will be controlled by integrated solid state circuit chips. The computer will automatically regulate the dissolved oxygen secondary treatment process by evaluating data from electrodes. Digesters will be operated according to the quantity and rate of gas production, measured by the BTU or heat meter. Fuel to power the treatment facility, as well as excess fuel for local power stations, will be supplied in the form of methane from the digesters. (Lisk-FIRL)
W78-08499

CONDUCTING VALUE ENGINEERING STUDIES--THE EXPERIENCE OF FIVE CITIES,
Culp, Wesner, Culp-Clean Water Consultants, El Dorado Hills, CA.
For primary bibliographic entry see Field 5G.
W78-08501

EFFECT OF GAMMA RAYS ON MICROORGANISMS AND CHEMICALS IN WATER, WASTEWATER, AND SLUDGE,
Florida Inst. of Tech., Melbourne. Univ. Center for Pollution Research.
D. D. Woodbridge, and P. C. Cooper.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 680, Price codes: A09 in paper copy, A01 in microfiche. Final Report to Army Facilities Engineering Support Agency, Report FESA-RT-2009, 1976. 175 p, 59 fig, 31 tab, 64 ref.

Descriptors: *Gamma rays, *Coliforms, *Chemical wastes, *Aeration, *Chlorination, Ozone, Oxygen, Bubble, Pathogenic bacteria, Sewage bacteria, Streptococcus, Irradiation, Disinfection, Waste water treatment, Trickling filters, Municipal wastes.

Gamma irradiation of secondary trickling filter effluent was evaluated in conjunction with air and oxygen bubbling, ozonation, and prechlorination for the treatment of bacteria and chemicals in waste water. Chemicals reduced by irradiation included: phenols, detergent surfactants, parathion,

and cyanide. Dissolved oxygen and free chlorine were removed; chloroform and carbon tetrachloride, byproducts of chlorination, were eliminated by irradiation and simultaneous oxygen bubbling. The destruction of coliforms by irradiation was enhanced in the presence of air or oxygen bubbling; chlorination before irradiation also had a synergistic effect. Irradiation was more effective in reducing coliforms in aqueous media than in sludge; undigested sludge was more treateble with gamma irradiation than digested sludge. Irradiation inactivation of the pathogenic bacteria, Streptococcus faecalis and Staphylococcus aureus, and the pathogenic amoeba, Naegleria gruberi, was tested. . Further research was recommended for pathogens and viruses. (Lisk-FIRL)
W78-08503

STUDIES ON THE TREATMENT OF NIGHT SOIL. VII. IDENTIFICATION OF BACTERIA ISOLATED FROM AEROBIC TREATMENT PLANT OF UNDILUTED NIGHT SOIL AND AMINO ACID UTILIZATION BY THESE BACTERIA (SHINYOSHORI NI KANSURU KENKYU (DAINANAHO)--MUKISHAKU SHINYO NO KOKUSEI SHORISHISETSU KARANO JOKASAIKIN NO BURNI RO SONO AMINO SAN BURKAINO),
Gifu Coll. of Pharmacy, (Japan). Dept. of Environmental Hygiene.
For primary bibliographic entry see Field 5A.
W78-08505

FINAL ENVIRONMENTAL IMPACT STATEMENT--CITY OF JACKSONVILLE, FLORIDA WASTEWATER MANAGEMENT FACILITIES, ARLINGTON-EAST SERVICE DISTRICT.
Environmental Protection Agency, Atlanta, GA. Region IV.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 590, Price codes: A12 in paper copy, A01 in microfiche. Report EPA 904/9-76-021, August 1976. 245 p, 15 fig, 1 tab.

Descriptors: *Environmental effects, *Environmental engineering, *Treatment facilities, *Outfall sewers, *Incineration, Aquatic animals, Construction, Salt marshes, Conveyance structures, Waste water treatment, Municipal wastes.

The final Environmental Impact Statement on the specifications of the 10 mgd regional waste water treatment plant planned for Jacksonville, Florida, was presented by the U. S. Environmental Protection Agency as a preliminary to awarding grants for funding the project. In addition to the waste water treatment plant, the project included 13,900 ft of outfall line to the St. Johns River and a 38,000 ft force main for pumping sludge to an incinerator. The impact of construction activity on aquatic animals in two salt marsh ponds, on wildlife, and on the surrounding communities was reviewed. The effect of the discharge of 10 mgd of treated effluent on the St. Johns River and the community development associated with the expanding waste water treatment facilities were evaluated. The alternative sites for the treatment plant, outfall, and force main were considered on a cost-effective basis. The Environmetal Impact Statement is a continuation of a draft presented in 1976. (Lisk-FIRL)
W78-08506

DIRECT ENVIRONMENTAL FACTORS AT MUNICIPAL WASTEWATER TREATMENT WORKS--EVALUATION AND CONTROL OF SITE AESTHETICS, AIR POLLUTANTS, NOISE AND OTHER OPERATION AND CONSTRUCTION FACTORS,
For primary bibliographic entry see Field 5G.
W78-08507

PRELIMINARY LISTING OF MUNICIPAL WASTE WATER TREATMENT CAPACITIES.
Oklahoma Foundation for Research and Development Utilization, Inc., Edmond.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 430, Price codes: A09 in paper copy, A01 in microfiche. Report EDA-OER-76-038, September 1976. 187 p, 50 tab. Prepared for Economic Development Administration, Washington, D.C., Office of Economic Research.

Descriptors: *Treatment facilities, *Municipal wastes, *Data collections, Population, *Surveys, Costs, Statistics, Census, Cities, Waste treatment, Profiles, Waste water treatment, Sewage.

A preliminary listing of all municipal waste water treatment facilities servicing populations over 2,000 in the United States wes compiled. The updated listing was devised by the Oklahoma Foundation for Research Development Utilization, Inc. for the Economic Development Administration. The municipal treatment facilities, categorized by state and county, are evaluated for the population served, based on data from the 1970 census. Municipalities within counties located in Economic Development Districts are noted. Each plant is classified according to the daily treatment capacity, the average daily use, the average daily per capita use rate, and the percentage of treatment facility capacity utilized. Predicted parameters recorded in the preliminary listing include the population expansion permitted by the present facility's design capacity, the estimated cost of expanding the plant for a utilization rate of 70% with a 20% impact margin, the use of the system approaching capacity or beyond cpacity, and a reference number for each municipal facility. The second phase of this project, planned for 1977, will correct, update, and refine the data. (Lisk-FIRL)
W78-08508

THE EFFECT OF TEMPERATURE ON THE GROWTH OF ACINETOBACTER CALCOACETICUS,
Orange Free State Univ., Bloemfontein (South Africa). Dept. of Microbiology.
J. C. Du Preez, and D. F. Toerien.
Water SA, Vol. 4, No. 1, p 10-13, January, 1978. 5 fig, 2 tab, 10 ref.

Descriptors: *Sewage bacteria, *Cultures, *Lipids, *Activated sludge, *Growth rates, Thermodynamic behavior, Microbial degradation, Microorganisms, Biological treatment, Waste water treatment, Municipal wastes.

The activated sludge organism, Acinetobacter calcoaceticus, was cultered in an acetate medium and in Tryptone soy broth over a temperature range of 16-40C to evaluate the influence of temperature on microbial growth. The growth rate of Acinetobacter calcoaceticus in the acetate medium peaked within a temperature range of 30-36 C; growth declined steadily until 40.6 C when growth ceased. The maximum specific growth rate was 1.17/hr; the pH of the acetate media ranged from an initial 6.7 and 8.6 during growth. Optimum temperature for growth in the Tryptone soy broth was 29-33 C, with growth ceasing above 37 C; the maximum specific growth rate was 1.28/hr. Arrhenius curves were plotted for the relationship between growth rate and temperature in both media. Activation energies calculated from the curves for Acinetobacter calcoaceticus in the soy broth ranged from 9.51-22.87 kilocalories; activation energies for the acetate medium ranged from 10.36-17.49 kilocalories. Optimum temperature for an activated sludge process utilizing A. calcoaceticus bacteria for fatty acid removal was considered to be 29-35 C. (Lisk-FIRL)
W78-08509

ADSORPTION IN THE ACTIVATED SLUDGE PROCESS,
Cape Town Univ. (South Africa). Dept. of Water Resources and Public Health Engineering.
G. A. Ekama, and G. V. R. Marais.
Water SA, Vol. 4, No. 1, p 39-48, January, 1978. 8 fig, 3 tab, 5 ref, 1 append.

Descriptors: *Activated sludge, *Nutrification, *Adsorption, *Analytical techniques, *Chemical oxygen demand, Oxygen demand, Oxygen requirements, Aerobic conditions, Laboratory tests, Waste water treatment, Municipal wastes.

The cause of sharp decreases in the oxygen consumption rate when waste water feed to an activated sludge reactor is stopped was investigated in laboratory tests. One unit was fed with COD-bearing influent containing low nitrogen levels during five test runs using a square wave system, equivalent to a 12 hr feeding period followed by a 12 hr period without feeding. The other unit was fed during three tests with influent at a constant COD concentration and low nitrogen levels at square wave additions of 24 mg NH4/hr. In the fourth test, the NH4 concentration was raised to 13.7 mg/hr. For the fifth test, the influent was spiked with an additional 20 mg NH4/hr. The units were monitored over a 10 hr period with sludge ages of 1.5 and 2.5 days. When the feeds were terminated, the unit fed on the square wave regimen exhibited an instantaneous steep reduction in oxygen consumption. The constant feed unit was unaffected. In the fifth test, both units displayed the same changes in oxygen consumption at feed termination. The oxygen consumption decline in the cyclically fed reactor was attributed to increased energy requirements for carbonaceous matter adsorption. An adsorption model incorporating the increased energy requirements was formulated in conjunction with Monod's nitrification equation and applied to the activated sludge model to improve process response predictions of oxygen consumption rate, effluent total Kjeldahl nitrogen, and nitrate concentrations. (Lisk-FIRL)
W78-08510

A RAPID CENTRIFUGE METHOD FOR DETERMINATION AND CONTROL OF SLUDGE CONCENTRATION IN ACTIVATED SLUDGE PLANTS,
National Inst. for Water Research, Pretoria (South Africa).
R. J. L. C. Drews.
Water SA, Vol. 4, No. 1, p 1-3, January, 1978. 2 fig, 1 tab, 3 ref.

Descriptors: *Centrifugation, *Activated sludge, *Analytical techniques, *Sludge treatment, *Bulk density, Physical properties, Gravimetric analysis, Volumetric analysis, Waste water treatment, Treatment facilities, Municipal wastes.

A centrifuge technique to measure mixed liquor suspended solids in activated sludge processes was developed as a more rapid alternative to the half-hour sludge settled volume test currently used by small treatment plants. Two graduated centrifuge tubes were filled with 15 ml of mixed liquor and centrifuged at 2,000 rpm for 2 min. Sludge levels were recorded immediately upon completion of centrifugation; values were multiplied by a centrifuge sludge volume factor calculated from the various solids retention times. A comparison of sludge concentration values obtained from 29 South African plant sludges by half-hour sludge settled volume tests and by the centrifuge method using 4,200 as the sludge volume verified that the centrifuge values were more reliable than the half-hour settling results and more easily obtained than gravimetric data. The half-hour test was still required to provide the sludge volume index for predicting sludge bulking potential. (Lisk-FIRL)
W78-08511

MASS TRANSFER AND REACTION RATE STUDIES OF OZONATED MUST WASTEWATERS IN THE PRESENCE OF SOUND WAVES,
Arizona Univ., Tucson. Dept. of Civil Engineering.
R. A. Sierka.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 026, Price codes: A07 in paper copy, A01 in microfiche. Technical Report UA-ENGR-1436, August 1976. 143 p, 31 fig, 7 tab, 14 ref, 5 append. Prepared for Army Medical Research and Development Command, Washington, D.C.

Descriptors: *Hospitals, *Ozone, *Reverse osmosis, *Disinfection, *Membrane processes, Organic wastes, Sodium compounds, Carbon, Chemical oxygen demand, Waste water treatment, Municipal wastes.

Ultrasonic waves were investigated for the treatment of synthetic, ozonated, and U.S. Army field hospital (MUST) wastes; reverse osmosis permeates; sodium acetate; urea; and Kodak X-ray developer and fixer. Ultrasonic treatment assisted in the decomposition of ozone, thus lowering the dissolved oxygen concentration. Mass transfer coefficients for ozone increased from 49.7 to 65.9/hr with ultrasound. While the organic stripping of MUST permeates was relatively unaffected by ultrasonic waves, ultrasound increased the rate and extent of ozone oxidation of the permeates in the higher and lower peak envelope power ranges. Total organic carbon and COD were reduced to 5 mg and 10 mg/liter, respectively, within two hrs at an ozonation rate of 236.4 mg/min with ultrasound. COD and total organic carbon level standards in permeates were achieved with a combination air stripper and ozone reactor which utilized 35% less ozone than a continuous ozonation system but required a longer reaction time. Ultrasonic treatment of sodium acetate improved its oxidation; urea, developer, and fixer solution oxidation was not significantly enhanced. The Kodak solutions could be oxidized before reverse osmosis treatment in the presence of sufficient ozone. (Lisk-FIRL)
W78-08512

THE HOUSTON SOLUTION: ADVANCED TREATMENT AND SLUDGE RECLAMATION.
Public Works, Vol. 109, No. 2, p 104, February, 1978.

Descriptors: *Activated sludge, *Nitrification, *Aeration, *Oxygen, *Sludge treatment, *Sludge digestion, Dewatering, Filtration, Biochemical oxygen demand, Treatment facilities, Fertilizers, Drying, Waste water treatment, Municipal wastes.

A two-stage activated sludge plant has been selected for treating waste water from a 53,500 acre section of Houston, Texas, containing one-third of the city's population and most of the business district. The first stage of the plant, following degritting and trash removal, reduces carbonaceous BOD by the activated sludge process. The second stage promotes nitrification with pure oxygen generated on-site in a cryogenic oxygen plant. The waste water then flows by gravity through rapid media filters followed by chlorination and discharge to the Buffalo Bayou and the Houston Ship Channel. The sewage sludge is thickened, aerobically digested, dewatered by vacuum filtration, and dried. An average of 112 tons/day of sludge is processed at the plant which has provisions for a peak capacity of 140 tons/day. The processed sludge is sold as commercial fertilizer. Sixty million dollars of the $220 million plant was allocated for the sludge processing plant. (Lisk-FIRL)
W78-08513

MARSH/POND SEWAGE TREATMENT PLANTS,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
M. M. Small.
Available from the National Technical Information Service, Springfield, VA 22161 as BNL-21237, Price codes: A02 in paper copy, A01 in microfiche. Report BNL-21237, March 1976. 15 p.

Descriptors: *Marshes, *Ponds, *Potable water, *Marsh plants, *Odor, Membranes, Plastics, Artificial recharge, Groundwater, Waste water treatment, Municipal wastes.

A marsh/pond sewage treatment system which purifies waste water to potable water standards at the Brookhaven National Laboratory in Upton, New York, is described. A prototype 10,000 gpd treatment system required 0.2 acres of marsh at a 1-ft depth followed by a 0.2 acre pond with a 5-ft depth. The system was completely underlined with a 20-mil polyvinyl chloride membrane to prevent groundwater infiltration of the waste water. A blend of sewage and septage is applied to the marsh at a rate of 50,000 gal/acre/day; a 20-acre site is required to treat 1 mgd. The marsh is planted with grasses, duckweeds, and cattails, although the continued growth of the cattails has been unsuccessful. The marsh/pond treatment system has been developed for populations up to 10,000, costing an estimated $0.60/gal/day for operation. (Lisk-FIRL)
W78-08514

FRESH WATER FROM SEWAGE ON LONG ISLAND,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
M. M. Small.
Available from the National Technical Information Service, Springfield, VA 22161 as BNL-21371, Price codes: A02 in paper copy, A01 in microfiche. Report BNL-21371, April 1967. 16 p, 10 ref.

Descriptors: *Marshes, *Ponds, *Grasslands, *Groundwater recharge, *Marsh plants, Seepage, Recharge ponds, Nutrient removal, Potable water, Waste water treatment, Sewage, Municipal wastes.

Sewage and cesspool contents were used to recharge groundwater in studies at the Brookhaven National Laboratory in Upton, New York. The waste water purification system was a sloping grass meadow draining into a planted marsh and eventually into a fish-stocked pond. The sewage was applied to the meadow where it permeated the soil and plant roots. The waste water passed through the marsh soils, plant stalks, and root before flowing into the pond. Overflow from the pond was usable as potable water. The same degree of purification could be attained by a marsh/pond system where meadowland is not available and there is a high population density. Both systems were completely lined so the waste water could not percolate into the groundwater before purification. The system produced no sludge or odor. The marsh/pond sewage treatment system costs an estimated $1,440,000, compared to $640,000,000 for a municipal sewage treatment plant. (Lisk-FIRL)
W78-08515

A MECHANISM FOR ASH ASSISTED SLUDGE DEWATERING,
Lehigh Univ., Bethlehem, PA. Center for Surface and Coatings Research.
F. J. Micale.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 070, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/2-76-297, December 1976. 51 p, 39 fig, 2 tab, 9 ref.

Descriptors: *Sludge treatment, *Activated sludge, *Flocculation, *Fly ash, *Settling velocity, Dewatering, Salts, Calcium compounds, Potassium compounds, Carbon, Silica, Polarity, Waste water treatment, Municipal wastes.

Fly ash and three types of ash from sludge incineration were evaluated as flocculants for improving activated sludge settleability. The ashes, with surface areas from 1.7-17 sq m/g, were washed to separate them into: a solid fraction containing two carbons, two silicas, and magnetite; and a liquid fraction of water soluble salts containing calcium fluoride, aluminum chloride, potassium phosphate, and anionic and cationic polymeric surfactants. Separate experiments were used to test the settling capabilities of the solids and the water soluble salts. Of the solids tested, the carbon black Elf-4 and the silica Quso H-40 were the most efficient flocculants because of their hydrophilic characteristics and high levels of polar groups. Flocculation of the alkaline activated sludge was enhanced by the polar surfaces which adsorbed the cationic and polar molecules and disrupted the sludge particle/liquid interfaces. In the water soluble salt tests, calcium fluoride and aluminum chloride promoted activated sludge settlement via preferential adsorption of the calcium and aluminum ions. Experiments using the unwashed ashes demonstrated that the ash with the most hydrophilic surface and the highest surface area had the greatest effect on activated sludge settleability. The reverse was true for this ash after washing. (Lisk-FIRL)
W78-08516

WASTEWATER RENOVATION BY A PROTOTYPE SLOW INFILTRATION LAND TREATMENT SYSTEM,
Cold Regions Research and Engineering Lab., Hanover, NH.
I. K. Iskandar, R. S. Sletten, D. C. Leggett, and T. F. Jenkins.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 744, Price codes: A04 in paper copy, A01 in microfiche. CRREL Report 76-19, June 1976. 51 p, 23 fig, 10 tab, 63 ref, 1 append.

Descriptors: *Percolation, *Return flow, *Nutrient removal, *Nitrogen, *Hydrologic properties, Phosphorus, Nitrates, Ammonia, Biochemical oxygen demand, Soil types, Coliforms, Carbon, Waste water treatment, Municipal wastes.

Six experimental sand loam and silt loam test cells at the United States Cold Regions Research and Engineering Laboratory in New Hampshire were spray irrigated with ozonated primary and secondary effluent for a one year period. The program's objective was to evaluate the effectiveness of waste water purification by slow land infiltration. Nitrogen, chloride, and suspended solids levels in the waste water varied with seasonal conditions; BOD, fecal coliforms, and organic carbon were reduced by secondary treatment with extended aeration. The application of 628-2055 kg/hectare total nitrogen, 85% of which was ammonia, to the soil cells over the one year period revealed that nitrogen was converted to nitrate-nitrogen in the top 45 cm of the soil. The concentration of nitrate in the soil percolates peaked at 125 mg/liter nitrate-nitrogen during the summer months and averaged 10 mg/liter during other periods. Ammonia-nitrogen leached through the soil cells only during winter months. A total nitrogen uptake of 26-54% by the forage grown on the soil cells was reported. The test cells removed 99% of the total phosphorus, averaging 7.0 and 7.1 mg/liter in the primary and secondary effluent, respectively. The test cells completely removed BOD, suspended solids, fecal coliform, and organic carbon. (Lisk-FIRL)
W78-08517

BACTERIAL AEROSOLS RESULTING FROM SPRAY IRRIGATION WITH WASTEWATER,
Army Medical Bioengineering Research and Development Laboratory, Fort Detrick, MD.
For primary bibliographic entry see Field 5A.
W78-08518

HANDBOOK OF WATER RESOURCES AND POLLUTION CONTROL.
Van Nostrand Reinhold Company, New York, 1976, 840 p. Edited by H. W. Gehm, J. I. Bregman and G. V. Beeland.

Descriptors: *Wastewater treatment, Water pollution control, *Water quality standards, *Water reuse, Municipal wastes, Industrial wastes, Water resources development, *Waste disposal, *Water distribution systems, *Water allocation(Applied), *Water treatment.

Advanced techniques for treatment of both municipal and industrial wastes, many of which are still in experimental stages, are presented. These techniques are also designed to increase available water supplies through the reuse of reclaimed wastewater. Advanced techniques of cost allocation among users of joint municipal/industrial waste treatment facilities are also discussed along with alternative methods of recovering costs. Joint treatment is frequently undertaken to obtain economies of scale, and federal law now requires industry to pay its full share of treatment in plants constructed with federal funding. The chapter on acceptable techniques for disposing of sludge resulting from waste treatment is of increasing importance as populations grow, treatment requirements become more stringent, and more solids are removed. As a guide to potential water demand, data are presented on actual water use by nearly 200 public water supplies in the U.S., information which is not tabulated in one source elsewhere. The treatment and distribution of potable water are covered in two chapters. The former presents the most modern practice in the preparation of potable water and provides a basis for meeting future requirements. The chapter on distribution will be especially useful to those responsible for extending water systems to serve burgeoning metropolitan areas. This is also true of the chapter 'Wastewater in the City,' which is concerned with projecting anticipated quantities of sewage, how to confine it, and how to remove it from its source. The potential for increasing the world's usable water supply through desalination of seawater is explored. This chapter discussed theoretical, practical, and economic considerations of the more promising processes of desalination. Innovative techniques for beneficial use of thermal discharges from power plants are described. These include increased-productivity greenhouses for vegetables as well as flowers, improved livestock production, and space heating. The book closes with a section-by-section analysis of the 1972 Amendments to the Federal Water Pollution Control Act which establish, for the foreseeabie future, the goals anticipated to be achieved in the nation's drive toward clean waterways.
W78-08543

EVALUATION OF TECHNIQUES FOR ALGAE REMOVAL FROM WASTEWATER STABILIZATION PONDS, REVIEW PAPER,
Utah State Univ., Logan. Coll. of Engineering; and Utah Water Research Lab., Logan.
E. J. Middlebrooks, D. B. Porcella, R. A. Gearheart, G. R. Marshall, and J. H. Reynolds.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 238, Price codes: A02 in paper copy, A01 in microfiche. Report No. PRJEW115-1, January, 1974. 20 p, 2 fig, 1 tab, 10 ref. OWRT A-015-UTAH(2), 14-31-0001-3845; and EPA 68-03-0281.

Descriptors: *Algae, *Algal control, Evaluation, Ponds, Waste water(Pollution), Waste water treatment, Waste storage, Stabilization, Centrifugation, Coagulation, Flocculation, Filtration, Soil filters, *Algal removal, Particulates, Microstraining, Containment.

Review and evaluation of techniques for algae removal from wastewater stabilization ponds are presented. Criteria for candidate processes for removal of particulate matter (e.g., microorganisms) include ease of operation, minimum maintenance and cost, dependability of operation, and efficiency of particulate removal, including preventing recycling biological oxygen demand and nutrients from decay of particulates. Processes reviewed are centrifugation, microstraining, coagulation-flocculation, containment, and soil filtration. The use of the soil mantle for polishing effluents is the most economically and technologically feasible method for algae removal, despite questions concerning environmental effects. Granular media filtration through soil mantles offers the advantages of automatic operation, clear effluent, low effluent biological oxygen demand, nutrient removal, and economy. (Wares-IPA)
W78-08544

PRESSURE FILTER FOR PURIFYING AQUEOUS INDUSTRIAL EFFLUENT-WITH A GRANULAR CHARGE AND PERFORATED PLATES, ONE OF WHICH MOVES UP AND DOWN,
A. M. Vyskrebets, E. I. Kozarskii, and B. V. Sudnik.
Soviet Patent SU 546-362. Issued March 17, 1977. Derwent Soviet Inventions Illustrated, Vol. A, No. 4, p 7, March, 1978. 1 fig.

Descriptors: *Patents, *Oily water, *Suspended solids, *Granules, *Membranes, Permeability, Design criteria, Equipment, Pressure, Filters, Filtration, Separation techniques, Waste water treatment, Industrial wastes.

A patent has been issued for a pressure filter which removes suspended solids and oils from rolling mill and other industrial effluents. A cyclindrical tank, equipped with waste water intake and filtrate outlet pipes, is filled with a granular charge. A vertically mobile conical diaphragm in an open cyclone is attached to one of several perforated drainage distributors. When in operation, a rod and gear move the perforated drainage distributors. When in operation, a rod and gear move the perforated plate bearing the granular charge into the upper section of the tank. As the granular material is pressed against the drainage plate, the waste water is introduced into a cyclone chamber which has a conical bottom. The waste water is forced under pressure through the diaphragm, the granular charge, and the drainage plate located in the upper section. The granular charge is washed as the perforated plate moves down through the liquid towards the drainage plate. Purified water is withdrawn from the top section of the tank. (Lisk-FIRL)
W78-08585

ELIMINATING AND RECOVERING NICKEL FROM AQUEOUS EFFLUENT--BY BOILING WITH SODIUM HYPOPHOSPHITE AND CATALYST SUCH AS PALLADIUM CHLORIDE.
French Patent FR 2346-458. Issued December 2, 1977. Derwent French Patents Abstracts, Vol. A, No. 4, p 4, March, 1978.

Descriptors: *Metals, *Nickel, *Patents, *Sodium compounds, *Boiling, Catalysts, Chemical reactions, Chlorides, Alkaline earth metals, Waste water treatment, Industrial wastes.

A patent has been issued for a waste water treatment process to remove nickel from aqueous effluents. The nickel-bearing effluent is treated with sodium hypophosphite and intensely agitated. The solution is maintained at its boiling point and at pH 9-11. the boiling solution is further treated with 0.2 mg/liter of a catalyst selected from the alkaline earth metal oxides and the metal chlorides. The solution is boiled at 90-100 C in the presence of 0.2 mg/liter of palladium chloride, the preferred catalyst. Nickel is recovered from the treated aqueous solution in reusable form. (Lisk-FIRL)
W78-08587

METHOD AND APPARATUS FOR WASTE WATER TREATMENT,
G. Bernreiter, and L. Truxa.
U.S. Patent No. 4,064,047, 7 p, 7 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 965, no 3, p 1050-1051, December 20, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Water pollution control, Water purification, Absorption, *Ozone, Equipment.

This invention provides an improved apparatus for, and method of, treating waste water which facilitates more efficient ozone absorption by the waste water than has been previously achieved. Waste water treatment apparatus comprises a spray nozzle, a waste water inlet connected to the spray nozzle, means for supplying waste water under pressure to the waste water inlet, means for charging the waste water prior to the discharge of the waste water, an ozone inlet for supplying ozone under pressure, and a waste water outlet. To maintain the pressure within the ozone absorption chamber, a syphon arrangement may be provided for withdrawing the waste water and for maintaining a head of waste water within the ozone absorption chamber above the waste water outlet. The charging of the waste water prior to the discharge of the waste water into the interior of the ozone absorption chamber may be effected by providing two or more electrodes in a waste water supply duct extending to the waste water inlet, the electrodes being electrically connected, and means being provided for supplying a d.c. current to the electrodes. (Sinha-OEIS)
W78-08590

SANITARY WASTE TREATMENT PLANT.
Australian Patent 487,761. Issued November 3, 1977. The Australian Official Journal of Patients, Trade Marks, and Designs, Vol 47, No 41, p 3738, November, 1977.

Descriptors: *Biological treatment, *Patents, *Water conveyance, *Permselective membranes, *Filtration, Membranes, Separation techniques, Treatment facilities, Water purification, Waste water treatment, Design criteria, Municipal wastes.

A patent has been issued for a biological treatment system which incorporates sanitary waste delivery and water recovery. Sanitary waste is transported to the treatment facility by the delivery system. Water used by the delivery system for the transport of wastes to the biological treatment unit is supplied by the water recovery system. Th sanitary wastes are degraded in a biological treatment apparatus and treated effluent is transported to the water recovery system. The effluent is passed through a semi-permeable membrane for solids separation. A portion of the solids is returned to the biological treatment for further degradation. The liquid fraction and the remaining effluent concentrate are refiltered through the membrane for further clarification. The permeate is returned to the delivery system for the transport of sanitary wastes to the biological treatment plant. (Lisk-FIRL)
W78-08597

WATER PURIFICATION BY TREATING WITH ACTIVATED CARBON BEFORE BIOCHEMICAL TREATMENT,
Phillips Petroleum Co., Bartlesville, OK. (Assignee).
M. R. Cines, and B. B. Buchanan.
U.S. Patnet No. 4,066,538, 6 p, 1 fig, 5 tab, 5 ref:Official Gazette of the United States Patent Office, Vol 966, No 1, p 246, January 3, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Organic wastes, Chemical wastes, *Activated carbon, Microorganisms, Microbioal degradation.

Waste water having a high chemical oxygen demand caused primarily by soluble organic matter is treated with activated carbon and thereafter passed to a biochemical treating operation. The invention is of primary applicability in treating waste water from chemical plants and most particularly applicable to the purification of effluents from oxidative dehydrogenation processes. The activated carbon treatment is utilized first to obtain a greatly improved result. The activated carbon removes the heavier impurities (for which it is best suited) and the biochemical treatment removes the light impurities for which it is best suited. If biochemical treatment is used first the heavy impurities retard the activity of the bacteria, insufficient impurities are removed without excessive carbon consumption, and serious reduction in bacteria coagulation results. (Sinha-OEIS)
W78-08602

APPARATUS AND METHOD FOR CONTINUOUS FROTH FLOTATION,
Agency of Industrial Science and Technology, Tokyo (Japan). (Assignee).
S. Wada, Y. Matsunaga, and M. Noda.
U.S. Patent No. 4,066,540, 6 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 966, No 1, p 247, January 3, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, *Separation techniques, Foam separation, Heavy metals, Equipment, *Froth flotation.

An apparatus for continuous froth flotation is disclosed which comprises a vertically elongate column having a froth separator, a raw water inlet pipe, a treated water discharge pipe, a gas dispersing unit, and stepped shelves arranged inside the column adapted to provide thorough contact between the bubbles and the water subjected to treatment. (Sinha-OEIS)
W78-08603

PROCESS FOR TREATING WASTE WATER CONTAINING POLYVINYL ALCOHOL,
Sando Iron Works Co., Ltd. (Japan). (Assignee).
Y. Sando, H. Ishidoshiro, and E. Nakano.
U.S. Patent No. 4,066,541, 4 p, 1 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 966, No 1, p 247, January 3, 1978.

Descriptors: *Patents, *Waste water treatment, *Organic wastes, *Water pollution treatment, Separation techniques, Chemical reactions, Recycling, *Polyvinyl alcohol, Boric acid.

To waste waters containing polyvinyl alcohol (P.V.A.), 0.1-0.2% of boric acid or borax and 0.3-0.6% of an inorganic salt such as sodium sulfate are added and the pH is adjusted to 8-10 with an oxide or hydroxide of an alkaline or alkali earth metal. This process is carried out at room temperature. When P.V.A. is the sole organic compound in the waste water, the mother liquor from which P.V.A. has been removed contains borate and inorganic salt and can be used for desizing of textiles. The recovered compound of V.V.A. wit boric acid can be used for a wide variety of applications such as processing of fiber and paper and for adhesives. (Sinha-OEIS)
W78-08604

METHOD OF PURIFICATION OF WASTE WATER BY TREATMENT WITH ZIRCONIUM SALT,
Shikoku Paper Mfg. Co., Ltd. (Japan). (Assignee).
B. Ayukawa.
U.S. Patent No. 4,066,542, 10 p, 6 ref; Official Gazette of the United States Patent Office, Vol 966, No 1, p 248, January 3, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Separation techniques, Coagulation, Chemical precipitation, Color, Pulp and paper industry, *Zirconium salts(Treatmen).

In a method for purification of waste water zirconium salts are used to coagulate and precipitate suspended substances and colloidal dispersed particles as well as non-colloidal dissolved organic and inorganic substances in waste water. The object of the invention resides in complete removal of suspended substances and colloidal dispersed particles as well as complete or partial removal of non-colloidal dissolve low molecular organic substances in the waste water derived from chemical pulping and paper mills so that oxygen demand and color are minimized and transparency is maximized in one process. (Sinha-OEIS)
W78-08605

CONTINUOUS PROCESS FOR NON-CATALYTIC OXIDATION OF SULFITE-CONTAINING WATERS,
Texaco Inc., New York. (Assignee).
D. E. McCoy.
U.S. Patent No. 4,066,543, 3 p, 1 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 966, No 1, p 248, January 3, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Water quality control, *Oxidation, Sulfite liquors, Sulfates, Pulp wastes.

The invention relates generally to air and water pollution abatement and more particularly to a continuous, liquid phase, air oxidation process for converting sulfites and bisulfites present in waste water streams to non-polluting, non-oxygen demanding sulfates. The process is a non-catalytic oxidation effected at 25 to 50 psi, 175-250F using from 50 to 350 percent excess of oxygen when utilizing air or any suitable oxygen containing gas basis stoichiometric conversion of sulfite to sulfate. (Sinha-OEIS)
W78-08606

APPARATUS FOR SEWAGE TREATMENT WITH COUNTERCURRENT HEAT TRANSFER MEANS,
S. Beaumont.
U.S. Patent No. 4,066,550, 13 p, 6 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 966, No 1, p 251, January 3, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution treatment, *Anaerobic bacteria, Thermophilic bacteria, Methane bacteria, *Anaerobic digestion, heat exchangers, Equipment.

An apparatus is disclosed for an anaerobic process in three stages having progressively higher temperatures up to 75C for digesting raw household sewage with methane-forming thermophilic bacteria, in which dolomite is added to control the pH of the system within the range 6.0-7.5. After a sterilization fourth stage at 82C or greater, the effluent is treated in a ground filter. Heat is countercurrently transferred from the sterilization stage effluent to the substrate of the digestion stages. The apparatus for carrying out this process has an underlying heat-exchange compartment and four concentric compartment, of wich the innermost is the sterilization stage compartment containing a heating means and the outermost compartment are flow chambers fo sequentially digesting the sewage in psychrophilic, mesophilic, and thermophilic stages, prior to sterilizing. The thermophilic stage contains a micron-size filter upon which a bacterial slime forms and which passes a sediment-free, treated effluent. Sterilized effluent from the fourth stage passes through the underlying heat-exchange compartment having the form of a truncated cone for heat exchange to the bottoms of the three concentric flow chambers. (Author)
W78-08609

PORTABLE WATER FILTRATION DEVICE,
Dynek Corp., Port Chester, NY. (Assignee).
For primary bibliographic entry see Field 5F.
W78-08610

WASTE DISPOSAL SYSTEM FOR CHEMICAL PLANTS,
Hitachi, Ltd., Tokyo (Japan).
T. Okada, N. Hosomi, and S. Kawamura.
Hitachi Review, Vol. 27, No. 1, p 27-32, January, 1978. 8 fig, 2 tab, 2 ref.

Descriptors: *Incineration, *Chemical wastes, *Sodium sulfate, *Chlorine, *Organic wastes, Quenching, Cooling, Venturi flumes, Linings, Corrosion control, Waste water treatment, Waste water disposal, Industrial wastes.

A high-temperature combustion technique has been developed by Hitachi, Ltd. of Tokyo, Japan, for the treatment of chlorinated organic wastes and sodium sulfate-bearing waste water. The process provides for the recovery of hydrochloric acid and disposal of caustic liquor. Free chlorine generation from chlorinated waste combustion has been reduced by directly spraying the combustion chamber, maintained at 1,250C, with water. A Venturi quencher which contans an inner porous carbon tube and an outer permeable carbon tube cools the exhaust gases from 1,000C to 90C. The quencher is followed by wet scrubbing without sodium hydroxide. The hydrochloric acid is recovered in a two-stage packed tower; chlorine and hydrogen chloride concentrations in the exhaust gas are reduced to 0.2-3.0 ppm. Caustic soda solutions from ethylene production are treated by high-temperature oxidation of sodium sulfide. Incineration at 900C also destroys grease and odor components in the spent liquor. The liquid is initially concentrated in a vaporizer before it is introduced into the incinerator through an atomizer. The sodium sulfate dissolved in the cooling water of the Venturi quencher, which reduces the flue gas temperature to 100C, can be discharged to a waste stream. The walls of the incinerator are covered with refractory material to prevent sodium sulfate corrosion. (Lisk-FIRL)
W78-08611

HYDROXYMETHANESULPHINATE SALTS AND RELATED DECOMPOSITON PRODUCTS IN WASTEWATER,
Florence Univ., (Italy). Inst. of Analytical Chemistry.
For primary bibliographic entry see Field 5A.
W78-08612

INCINERATION OF ALKALINE WASTE LIQUORS,
Badische-Anilin und Soda-Febrik A.G., Ludwigshafen am. Rhein (West Germany).
For primary bibliographic entry see Field 5E.
W78-08613

DESIGN ALLOWS FOR DIVERSIFICATION,
Dewante and Stowell, Sacramento, CA.
F. J. Fahlen.
Water and Waste Engineering, Vol. 15, No. 4, p 30-32, April, 1978. 2 fig, 1 tab.

Descriptors: *Food processing industry, *Canneries, *Treatment facilities, *Seasonal, *Peaches, Stone fruits, Peak discharge, Biochemical oxygen demand, Activated sludge, Sludge digestion, Waste water treatment, Industrial wastes.

The $12.5 million waste water treatment plant in Yuba City, California, has a design capacity of 7 mgd for treating large quantities of influent with more than 46,000 lbs/day of BOD, originating from the seasonal processing of peaches and prunes. The treatment plant has handled BOD loads during the peak processing summer months that were as

much as 22% higher than the design capacity. Waste water flows by gravity to lift pumps which transport the influent through an aerated degritting chamber. Primary sedimentation is followed by biological membrane filtration and oxygenation. The oxygenated waste water receives secondary clarification and final chlorination before it is discharged into receiving waters or into percolation ponds during dry seasons. Waste activated sludge from primary solids digestion is thickened in dissolved air flotation tanks. The sludge receives secondary digestion and is dewatered by vacuum filtration before lan disposal. The plant was designed to reduce BOD concentrations by 97.5% with lower reductions experienced for COD and suspended solids. (Lisk-FIRL)
W78-08614

SOLVENT EXTRACTION STUDIES OF ZINC WITH ALAMINE 336 IN AQUEOUS CHLORIDE AND BROMIDE MEDIA,
Texas Southern Univ., Houston. Dept. of Chemistry.
C. W. McDonald, and N. Butt.
Separation Science and Technology, Vol. 13, No. 1, p 39-46, 1978. 8 tab, 8 ref.

Descriptors: *Zinc, *Metals, *Aqueous solutions, *Solvent extractions, *Chlorides, Bromides, Separation techniques, Solubility, Solvents, Waste water treatment, Industrial wastes.

The parameters influencing the removal of zinc from aqueous chloride and bromide solutions by Alamine 336 or impure tricaprylamine were investigated in laboratory experiments. Increasing the concentration of Alamine 336, in solution with xylene, to 0.10 M increased zinc removal to 99.25% in a 1.0 M HCL solution. When the concentration of Alamine 336 was held constant at 0.1 M, 99.8% of the zinc was extracted at an HCL concentrtion of 1.08 M. Zinc extraction efficiency increased to 99% removal when the pH was less than 1 and Alamine 336 was held constant at 0.1 M in a 0.4 M aqueous chloride solution. The stripping of znc from a 5% Alamine 336 solution was 99% or greater with 0.20 M NaOH, 0.5 M NH40H, and 0.02, 0.05, and 0.1 M EDTA. Similar experiments for removing zinc from hydrobromic acid solutions demonstrated that 0.10 M Alamine 336 reduced zinc by 99.2%; a 2.18 M HBr solution treated with 0.1 M Alamine 336 also reduced zinc by 99.2%. Zinc was more effecienlty removed from acidic media at pH 0.23, 89.9% of the zinc was removed. The removal efficiencies of strippants in the HBr solution were similar to those obtained by chloride solution stripping. Zinc in a chloride solution was more readily removed at high aqueous to organic ratios than in the bromide system. (Lisk-FIRL)
W78-08615

TREATMENT OF WASTE OIL EMULSIONS BY ULTRAFILTRATION,
W. Priest.
Water and Waste Treatment, Vol. 21, No. 3, p 42-43, March, 1978.

Descriptors: *Filtration, *Oil wastes, *Emulsions, *Membranes, *Separation techniques, Semipermeable membranes, Emulsifiers, Membrane processes, Reverse osmosis, Chemical precipitation, Waste water treatment, Industrial wastes.

Ultrafiltration is described for the purification of waste oil emulsions from the refining industry. Chemical treatment with aluminum sulfate reduces the oil content to 100-150 ppm, a level requiring further processing that may not be able to break down some difficult or synthetic emulsions. Ultrafiltration requires 1-10 bars of pressure without the need for backwashing of the filter. Membrane materials that can be used for oil emulsion separation include cellulose acetate, vinyl, acrylonitrils, acrylamide polymers, and copolymers. Pretreatment to remove surface tramp oil and settled solids is required before ultrafiltration. The emulsion is continuously filtered through the paper tube-supported membrane at a rate of 20 liters/min at 8 bars pressure. The emulsion is concentrated to 50% oil and permeate passes through a second tank to overflow. The permeate is used as a flushing agent at the end of the ultrafiltration cycle. The emulsion is concentrated by 3-50%, representing a 94% volume reduction; the concentrate can be incinerated or skimmed for fuel oil. The final effluent has an oil content below 20 ppm and reduced COD levels. (Lisk-FIRL)
W78-08618

DETERMINATION OF BLACK LIQUOR SOLIDS CONTENT,
Combustion Engineering, Inc., Windsor, CT.
For primary bibliographic entry see Field 5A.
W78-08619

BIO-SOLIDS DEWATERING AND DISPOSAL AT A SULPHITE MILL,
Edde (Howard), Inc., Bellevue, WA.
H. Edde.
Pulp and Paper of Canada, Vol. 79, No. 3, p 65-68, March, 1978. 6 tab, 11 ref.

Descriptors: *Pulp and paper industry, *Sulfite liquors, *Sludge treatment, *Dewatering, *Incineration, Centrifugation, Solvent extractions, Biochemical oxygen demand, Chemical precipitation, Activated sludge, Aeration, Oxygenation, Pilot plants, Waste water treatment, Industrial wastes.

Dewatering methods were tested with biological sludges produced by three pilot plants treating wastes from the Alaska Lumber and Pulp Co., Inc., an acid sulfite pulp mill in Sitka, Alaska. Waste water BOD produced at a rate of 110,000 lbs/day, was reduced to 47,850 lbs/day by air activated sludge, oxygen activated sludge, or a rotating bio-disc. Chemical sludge treament with lime, lime plus ferric chloride, or polymer did not effectively increase the solids content. The three sludges could be dewatered to 3-4% solids by gravity thickening. Additional sludge dewatering techniques investigated included: vacuum belt, coil, and pressure filtration systems; centrifugation; and solvent extraction. While the oxygen activated sludge was most easily dewatered with centrifugation, this method produced a centrate with high suspended solids concentrations. Solvent extraction required temperature control and was untested in full-scale operations. The coil and pressure filtration system effectively dewatered primary and secondary sludge without chemical conditioning. The process finally selected for the pulp mill included an air activated sludge system with coil filtration and V-press dewatering. The activated sluge is mixed with an equal amount of primary sludge; the mixture is filtered and pressed with or without bark additions. The dewatered sludge is incinerated in an existing boiler. (Lisk-FIRL)
W78-08620

HIGH-EFFICIENCY BROWNSTOCK WASHER SYSTEMS--CONSIDERATIONS IN MEASURING LOSSES,
Chesapeake Corp. of Virginia, West Point.
W. D. South, and D. W. Gulley.
Tappi, Vol. 61, No. 5, p 61-63, May, 1978. 5 fig.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Fibers(Plant), *Sodium, *Biochemical oxygen demand, Color, Dissolved solids, Systems analysis, Evaluation, Measurement, Waste water treatment, Industrial wastes.

Sodium losses from brownstock washer systems used in pulp processing are compared in relationship to BOD, total dissolved solids, and color. The washable sodium loss is dependent upon the total sodium, determined by direct means such as flame spectrophotometry. The components of total sodium include: bound sodium, that which is adsorbed onto the fibers; wash water sodium, that remaining portion of the total sodium removable by washing of the brownstock. The rate of BOD and color removal in washing systems may be different from the removal rate of sodium. Data from a brownstock washer line indicates that sodium is removed at a higher rate than color or total dissolved solids during second stage washing. The efficiency of BOD removal in a brownstock washer system is also not dependent upon sodium removal because pulp mill condensates utilized as shower water may have high BOD concentrations, up to 50% of the total BOD. Shower water quality must be considered before sodium, total dissolved solids, color, and BOD removal efficiencies of a brownstock washer system are calculated. (Lisk-FIRL)
W78-08621

ACTIVATED CARBON ADSORPTION PROCESS FOR PURIFICATION OF TEXTILE WASTEWATER,
McGill Univ., Montreal (Quebec). Dept. of Chemical Engineering.
C. Roy, and B. Volesky.
Textile Chemist and Colorist, Vol. 10, No. 5, p 26-33, May, 1978. 7 fig, 1 tab, 61 ref.

Descriptors: *Textiles, *Activated carbon, *Adsorption, *Dyes, *Design criteria, Evaluation, Equipment, Biochemical oxygen demand, Chemical oxygen demand, Color, Waste water treatment, Industrial wastes.

The design parameters of activated carbon systems were evaluated for the treatment of textile industry wastes. The initial consideration in carbon adsorption design is the selection of either easily regenerated and carbon-efficient granular carbon or of cost-effective powdered carbon. Adsorber designs available include: fixed bed, in which the entire volume of spent carbon is replaced at one time; and moving bed, in which spent carbon is removed periodically from the bottom and replaced through the top. Options in adsorber system configuration include: single adsorbers; two or more in series or in parallel; or four or more in series or in parallel. A configuration incorporating two or more adsorbers is recommended for large flow rates. Carbon can be thermally regenerated in multiple hearth furnaces, rotary kilns, fluidized bed furnaces, and transport reactors. Chemical regeneration methods using acid or base extraction, chemical oxidation, solvent extraction, and wet oxidation are also available. The performance of various activated carbon treatment systems currently operating in textile plants is reviewed with respect to design, influent, and effluent characteristics. (Lisk-FIRL)
W78-08622

DEVELOPMENT OF WASTE WATER TREATMENT AT THE CLIMAX MINE,
Climax Molybdenum Co., Golden, CO.
R. D. Gott, and J. M. Laferty, Jr.
Industrial Water Engineering, Vol. 15, No. 2, p 6, 8-13, March, 1978. 6 fig, 12 tab.

Descriptors: *Acid mine water, *Mine drainage, *Molybdenum, *Heavy metals, *Anion exchange, Resins, Electrochemistry, Coagulation, Flotation, Nitrogen compounds, Copper, Zinc, Cadmium, Manganese, Iron, Solvent extractions, Sodium compounds, Waste water treatment, Industrial wastes.

A counter-current ion exchange column reduces molybdenum levels in outfall drainage waste water from Climax Molybdenum Co.'s mining operation in Golden, Colorado. Pilot plant studies on reducing heavy metals and cyanide in the mill effluent have been conducted since 1975 with a Chem-Seps

counter-current ion exchange unit. Targe concentrations of heavy metals in the effluent were 2.0 ppm Fe and Mo, 1.0 ppm Mn, < 1.0 ppm Cu, Zn, and Cd, and 0.025 ppm CN. The pilot plant, equipped with a weak-base amine type anion exchange resin, treated waste water bearing 2-20 mg/liter Mo at a downflow rate of 41 gpm/sq ft. Mo extractions by the resin were 98%; elution and regeneration of the resin were performed with NaOH and H2SO4. Further heavy metal polishing was achieved with a Swift Lectro Clear electrocoagulation-electroflotation system. NaOCl solutions were added to the system to reduce cyanide to within allowed discharge levels. High rate san filtration reduced heavy meta' concentrations to within standards. The recc·ered Mo was processed with solvent extraction-crystallization for resale as sodium molybdate. Electro-flotation materials were stored with other tailings in an impoundment area. (Lisk-FIRL)
W78-08623

CU/U ORE-LEACHING ROUTE CUTS POLLUTION, TRIMS COSTS,
For primary bibliographic entry see Field 3D.
W78-08624

COPRECIPITATION OF ACID CHEESE WHEY AND TANNERY WASTE AND RECOVERY OF PROTEIN,
Agricultural Research Service, Philadelphia, PA. Eastern Regional Research Center.
R. E. Townsend.
Biotechnology and Bioengineering, Vol 20, No 4, p 589-599, 1978. 2 fig, 2 tab, 27 ref.

Descriptors: *Tannery wastes, *Dairy industry, *Chemical precipitation, *Proteins, *Amino acids, Acidity, Alkalinity, Heat treatment, Lime, Sulfides, Nutrients, Feeds, Waste water treatment, Industrial wastes.

Coprecipitation of acid cheese whey and dehairing lime-sulfide tannery effluents yields a precipitate which is high in essential amino acids and suitable as a feed supplement. The acid whey, with a pH of 4.39-4.61 and nitrogen concentrations of 1.2-1.4 mg/liter, is generally heated to render proteins insoluble. Several acid whey proteins are resistent to heat denaturation. The lime-sulfide dehairing waste water, at pH 12-13, contains dissolved hair protein, sulfur compounds, and high concentrations of dissolved and insoluble solids and BOD. At room temperature, the two-waste mixture, containing 20-40% tannery effluent, spontaneously produced centrifugeable precipitates with 17% of the total nitrogen and clear liquor. Heating of the supernatant for 15 min at 70C extracted an additional 20-25% of the total nitrogen; all soluble protein was removed from the supernatant by heating when tannery effluent content was 15-30%; lactose, nonprotein nitrogen, and excess sulfide remained in solution. Acid whey and tannery waste, mixed in a 4:1 ratio at pH 9.5 and 25C, produced spontaneous precipitates; the supernatant was steam heated to 80C for further protein removal. The heat-induced precipitate had higher amino acid concentrations than the spontaneous coprecipitates. The COD content of the supernatant was reduced by 16% after coprecipitation; total sulfur and total solids contents were 26 mg/ml and 8.5% by weight, respectively. (Lisk-FIRL)
W78-08626

THE PRINCIPLES AND METHODS OF CHROMIUM RECOVERY IN THE TANNERY,
Allied Chemical Corp., Morristown, NJ. Industrial Chemicals Div.
R. Smith.
The Leather Manufacturer, Vol 95, No 4, p 16-22, April 1978. 3 fig, 4 tab.

Descriptors: *Tannery wastes, *Chromium, *Recycling, *Chemical precipitation, *Ionization, Organic acids, Amino acids, Chelation, Incineration, Acidity, Alkalinity, Waste water treatment, Industrial wastes.

Techniques for improving chromium uptake, reusing spent chromium liquor, precipitating chromium as a hydroxide, and incinerating solid chromium are described for tannery effluents. Chromium exhaustion in the tanning bath can be improved by increasing the reactivity between the hide and the chromium sulfate. This can be accomplished by maximizing the ionization of the carboxyl groups of the amino acid side chains to form a polypeptide chain. A higher pH is required for ionization; chromium sulfate becomes insoluble above pH 5, the isoelectric point of collagen. Chelating agents, such as formic, acetic, or oxalic acid, can improve the solubility of chromium sulfate in the higher pH ranges. Conditioning of spent chrome tanning liquor for reuse requires acidification of the bath to remove hydroxyls for improved astringency. The spent liquor is sieved, cooled to 33C, and adjusted to pH is skimmed from the top; the solids removed from the bottom; and the conditioned liquor is ready for reuse. Chromium can be removed from the waste solution as a regenerable hydroxide by precipitation with alkali at pH 8-9. Magnesium oxide or polymers improve the floc characteristics of the chromium hydroxide; the hydroxide is regenerated in sulfuric acid. Alkaline oxidative incineration of chromium oxide produces soluble hexavalent chromium which is recoverable from other insoluble oxides. (Lisk-FIRL)
W78-08627

FILTER FOR REMOVING RESIDUES FROM DOMESTIC SEWAGE--COMPRISES MULTILAYER FILTER BEDS IN WHICH THE PARTICLES OF CHARGE DIMINISH.
Soviet Patent SU 552-096. Issued April 15, 1977. Derwent Soviet Inventions Illustrated, Vol. A, No. 6, p 1, March, 1978. 1 fig.

Descriptors: *Filtration, *Domestic wastes, *Patents, *Absorption, *Critical flow, Particle size, Porous media, Suspended solids, Centrifugal pumps, Hydraulic design, Design criteria, Equipment, Construction materials, Pipes, Waste water treatment.

A multilayer, charged particle filtration system with a variable velocity gradient for removing suspended solids from domestic wastes has been patented. The system consists of a conical shaped body with internal horizontal gratings for supporting the charged filtration medium and an externally-mounted centrifugal pump at the base. Each layer of charged particles in the filter has the same hydraulic size. The particle size in each ascending filtration layer diminishes as the upward flow of liquid approaches the top of the unit. Waste water is introduced through a pipe at the base of the system by the centrifugal pump. The effluent passes upward through a distribution system into the layers of charged filter particles. The rate of filtration with respect to the hydraulic particle size within each layer is calculated as the critical flow rate multiplied by a coefficient in the range of 1.02-2.8. The flow rate of the waste water through the layers is adjusted so that the relative mobility of the charged particles is equivalent to the maximum absorption capacity of the particles in each layer; minimum relative mobility of the particles is maintained. The filter is regenerated when the layers contain the capacity load of residue from the waste water by pumping wash water upwards through the layers in the direction of waste water flow during filtration. (Lisk-FIRL)
W78-08657

DISEASE GERM TREATMENT FOR SEWAGE SLUDGE--BY PURE OXYGEN CONVERTED BY ELECTRON BEAM TO OZONE BUBBLING THROUGH SEWAGE LAYER.
German Patent DS 2546-756. Issued March 9, 1978. Derwent German Patents Abstracts, Vol. A, No. 11, p 3, April, 1978.

Descriptors: *Patents, *Ozone, *Oxygen, *Bubbles, *Turbulence, Equipment, Electronic equipment, Design data, Gases, Disinfection, Sewage, Sludge treatment, Waste water treatment, Municipal wastes.

A patent has issued to Werner and Pfleiderer for a continuous process to disinfect sewage sludge. A thin layer of sludge is transported on a conveyor channel which is equipped with a device to maintain an even sludge layer thickness. Oxygen-bearing gas is bubbled through the sludge layer via the nozzle base formed by the flat bottom of the sludge conveyor channel. The sludge layer, agitated by the gas, is subjected to an electron beam source which produces ozone. The gas is immediately drawn off and reapplied to the sludge on the conveyor via a suction nozzle connected to the nozzle base. (Lisk-FIRL)
W78-08739

LIQUID ACTIVATED SLUDGE TREATMENT--IN TANK WITH ELECTRODE SYSTEM PRODUCING GAS BUBBLES SAVES POWER BY SULPHURIC ACID ADDITION.
French Patent FR 2348-891. Issued December 23, 1977. Derwent French Patents Abstracts, Vol A, No 6, p 9, March 1978.

Descriptors: *Activated sludge, *Patents, *Sulfur compounds, *Flocculation, *Electrodes, Bubbles, Anodes, Cathodes, Acidity, Scum, Flotation, Sludge treatment, Waste water treatment, Municipal wastes.

An activated sludge treatment process which incorporates sulfuric acid conditioning flocculation, and electrode-generated bubbling has been patented. The activated sludge is first adjusted to pH 2.5 with additions of sulfuric acid; acidity is monitored with a pH meter. The sludge flows through a pipe into a treatment tank containing two cathodes, mounted above the bottom plates, and anodes, formed by parallel rods. These electrodes generate bubbles which float suspended solids in the form of scum to the surface of the tank. The sulfuric acid addition permits a higher sludge throughout, thereby reducing the electrical power costs of the treatment system. (Lisk-FIRL)
W78-08749

LAND APPLICATION OF SELECTED HOME WASTEWATER,
Metcalf and Eddy, Inc., Boston, MA.
For primary bibliographic entry see Field 5E.
W78-08759

LOW-PRESSURE SEWAGE SYSTEM FOR BUILDINGS--USES LARGE VENTILATED BACK-PRESSURE TANK, TO PREVENT FLOODING.
For primary bibliographic entry see Field 8C.
W78-08761

SEWAGE DISPOSAL SYSTEM.
Australian Patent 490,208. Issued February 16, 1978. The Australian Official Journal of Patents, Trade Marks, and Designs, Vol. 48, No. 5, p 406, February, 1978.

Descriptors: *Separation techniques, *Patents, *Domestic wastes, *Sewerage, *Plumbing, Specific gravity, Settling basins, Monitoring, Water levels, Measurement, Sewage disposa, Sanitary engineering, Design criteria, Waste water disposal.

A sewage disposal system has been patented for water closets designed to incorporate a reuseable non-aqueous flush medium with a specific gravity lower than water. The medium bearing the wastes is flushed to a separating tank equipped with a sewage inlet at the top. In the separating tank, the flushing medium floats to the top because of its

lower specific gravity while the sewage settles to the bottom of the tank. Attached to the separating tank is a transfer apparatus for removing the settled sewage from the tank. A sewage level sensor is mounted in a branch conduit located outside the separating tank. When a specified sewage level is detected in the separating tank by the sensor, the sewage transport system is activated to remove the sewage. Minimum loss of the flushing medium is achieved with this process. (Lisk-FIRL)
W78-08763

PROCESS FOR THE DISPOSAL OF SEWAGE,
Monsanto Research Corps., St. Louis, MO. (Assignee).
R. E. Opferkuch, Jr., and G. M. Wong-Chong.
United States Patent 4,076,620. Issued February 28, 1978. Official Gazette of the United States Patent Office, Vol. 967, No. 4, p 1570, February, 1978. 1 fig.

Descriptors: *Carbon dioxide, *Lime, *Patents, *Settling basins, *Alkalinity, Separation techniques, Turbidity, Chemical oxygen demand, Waste water treatment, Design criteria, Municipal wastes.

A sewage treatment system employing lime and carbon dioxide additions has been patented. Trash and other objects in the sewage are removed by a degritter before lime is added at a 1:1 ratio with COD to the effluent. At least 500 ppm lime is added to the sewage to assist in carbonation and in separation of the solids from the liquid effluent. Lime coagulation is maintaned for 30 min or less to promote a Jackson Turbidity Unit of less than 50 in the separated sewage. The effluent is treated with carbon dioxide to adjust the pH to 10.6-11.2 and the solids are allowed to settle for 30 min. The solids are separated from the liquid fraction and concentrated for further dewatering. The concentrated solids and the settled solids are adjusted to pH 6-8 with carbon dioxide and discharged. (Lisk-FIRL)
W78-08764

BRIGHTON'S SEWAGE GOES TO SEA.
Surveyor, Vol. 150, No. 4456, p 8, November, 1977.

Descriptors: *Outfall sewers, *Outlets, *Excavation, *Waste water disposal, *Tunneling, Discharge lines, Tunnel construction, Construction, Pumping plants, Screens, Waste water treatment, Municipal wastes.

The 1,830 m long Portobello outfall has a design discharge capacity of 6,800 liters/sec for disposal of wastes from Brighton and Hove, England. The waste disposing tunnel, with an internal diameter of 2.13 m, discharges effluent to the English Channel through a diffuser located 14.4 m below the water surface. Waste water is transported from a pumping station to the outfall tunnel through a 3.4 m diameter shaft laid 44 m deep. The bolted segments of the shaft required peripheral ring grouting around the outside of the shaft to prepare the chalf cliff before installation. Influent reaching the pumping station is treated with coarse raked bar screens and fine mesh cup screens before discharge to the outfall. Screened solids and grit are passed through a pre-breaker, followed by dewatering to 50-55% moisture content in twin-screw presses. The outfall was assembled above water to eliminate the expense of compensating for high pressures at the 44 m water depth; air tools were required for excavating the chalk face of the cliff. The construction site was initially grouted until increasing deterioration was abated by lining the chalk with bolted cast iron rings. The outfall replaces a former structure that had a capacity of 680 liters/sec. (Lisk-FIRL)
W78-08765

COMBINATION TANKER FOR SEWER JETTING AND GULLY EMPTYING.
For primary bibliographic entry see Field 8C.
W78-08771

SEWAGE PLANT USES HOLE IN GROUND.
Engineering News-Record, Vol. 200, No. 1, p 12, January, 1978. 1 fig.

Descriptors: *Activated sludge, *Shafts(Excasvation), *Drilling, *Aeration, *Flotation, Sludge disposal, Construction equipment, Construction, Drilling equipment, Waste water treatment, Municipal wastes.

Eco-Research Ltd. of Canada has developed a deep shaft aeration and activated sludge treatment system for Virden, Manitoba, Canada. The $1.5 million municipal waste treatment plant with a design capacity of 600,000 gpd employs a 500-ft deep shaft with a 30-inch diameter. Waste water mixed with activated sludge is rapidly circulated within the shaft by compressed air. The aerated, biologicaly treated waste water is passed to a continuously operating flotation tank for gravity sedimentation of solids. A greater volume of waste water can be treated in less time because of rapid circulation and elimination of settling basin cleaning. The plant is constructed on a 10,000 sq ft site; the shaft was drilled with conventional well drilling equipment. The air compressor is driven by a 2-hp pump which constitutes the major energy demand of the plant. The design of the deep shaft evolved from experiments on the fermentation of methanol for single-cell protein generation with intense aeration. (Lisk-FIRL)
W78-08772

IMPORTED SEWAGE TREATMENT SYSTEM CLAIMED TO CUT COSTS, ENERGY USE.
Engineering News-Record, Vol. 200, No. 1, p 16, January, 1978.

Descriptors: *Activated sludge, *Aeration, *Treatment facilities, *Circulation, *Biological treatment, Biochemical oxygen demand, Capital costs, Aerated lagoons, Waste water treatment, Municipal wastes.

Designs for the municipal sewage treatment facility in Campbellsville, Kentucky, include installation of a 4.2 mgd Dutch Caroussel activated sludge system. The waste water is aerated and circulated through a baffled oval basin divided into channels with depths up to 15 ft. Aeration and circulation at 1 ft/sec or more are maintained by vertical aerators mounted at one end of the basin. Dilution of the raw sewage in a ratio of 50:1 with mixed liquor stabilizes the biological process under shock load conditions. Capital costs of the Kentucky plant are expected to be 50% lower than those for a conventional activated sludge system with a 20% operational energy savings. The imported Caroussel system converts nitrates into nitrogen gas and oxygen without additional treatment. A 500,000 gpd system that has been operational for one year in a leather tannery in New Hampshire has reduced BOD in the treated effluent to 3-7 ppm. (Lisk-FIRL)
W78-08773

SINGLE BASIN TREATS SEWAGE SIMPLY.
Engineering News-Record, Vol. 200, No. 15, p 89, April, 1978. 1 fig.

Descriptors: *Activated sludge, *Aeration, *Sludge digestion, *Treatment facilities, *Aerated lagoons, Sludge treatment, Nutrient removal, Nitrification, Biological treatment, Waste water treatment, Municipal wastes.

Mixing Equipment Company of Rochester, New York, has been distribution of a single basin waste water treatment plant with a capacity of 10 mgd. The process employs activated sludge to treat waste water with BOD and suspended solids concentrations up to 3,000 ppm and produces an effluent with less solids than other processes. The plant utilizes a common concrete wall between the aeration chamber and the clarifier at a cost savings. The system has either a surface or submerged aerator which returns settled sludge from the clarifier to the aeration basin. The system reportedly handles biological shock loads by mixing the loads with mixed liquor to prevent overload. Chemicals can be added directly to the basin to effect nitrification and phosphorus removal. The system is equipped with automatic sludge return; sludge produced has properties equivalent to those of aerobically digested sludge. (Lisk-FIRL)
W78-08775

INFRARED SLUDGE INCINERATORS OPERATIONAL IN TEXAS SEWAGE PLANT.
For primary bibliographic entry see Field 5E.
W78-08776

THAMES WA OUTLINES ITS COST STUDY ON SLUDGE.
Surveyor, Vol. 150, No. 4455, p 18, October, 1977. 1 tab.

Descriptors: *Sludge treatment, *Sludge disposal, *Incineration, *Drying, *Dewatering, Irrigation practices, Land reclamation, Landfills, Sludge digestion, Cost analysis, Waste water treatment, Municipal wastes.

Methods and costs of sludge treatment were analyzed by England's Thames Water Authority. Of the Water Authorities' 305,000 tons of dry solids (tds) produced from their annual 10 million tons sludge/yr, 154,000 tons are applied to agricultural land and 51,000 to land reclamation or fill. Sixty-nine percent of these solids are treated with heat digestion. The remaining sludge is reduced by mechanical dewatering, sludge thickening lagoons, or shipped to sea for disposal. The total cost, for a population of 500,000, of treating primary and secondary sludge by heat digestion is 14 pounds sterling/tds; by lime stabilization, 3-5 pounds/tds; by earth-banked dewatering lagoons, 6.7 pounds/tds; and by mechanical drying beds for digested sludge only, 52 pounds/tds. Vacuum filtration produces a sludge containing 18-20% dry solids at 10 pounds/tds. An 18-20% dry solids sludge costs 14 pounds/tds by centrifugal dewatering. Band or belt presses dewater sludges to 25-35% dry solids at an expense of 17 pounds/tds, while filter presses achieve a dry solids content of 35-40% at a cost of 19 pounds/tds. Incineration of sludge from populations of 100,000 and 500,000 costs 159 and 74 pounds sterling/tds, respectively. (Lisk-FIRL)
W78-08777

TARGET: TOXIN REMOVAL,
Ecodyne Corp., Union, NJ.
For primary bibliographic entry see Field 5G.
W78-08784

5E. Ultimate Disposal Of Wastes

VEGETATIVE STABILIZATION OF SPENT OIL SHALES: VEGETATION, MOISTURE, SALINITY, AND RUNOFF - 1973-1976,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 5G.
W78-08268

SALT REMOVAL EFFICIENCIES ON LAND DISPOSAL OF SWINE WASTE,
Alcorn State Univ., Lorman, MS.
For primary bibliographic entry see Field 5D.
W78-08302

AN ENVIRONMENTAL OVERVIEW OF GEOTHERMAL RESOURCES DEVELOPMENT,
Indiana Univ. at Bloomington. School of Law.
For primary bibliographic entry see Field 5G.
W78-08327

MANAGEMENT OF BOTTOM SEDIMENTS CONTAINING TOXIC SUBSTANCES: PROCEEDINGS OF THE SECOND U.S.-JAPAN EXPERTS' MEETING--OCTOBER 1976, TOKYO, JAPAN.
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5G.
W78-08359

USING SAND FILL TO COVER DREDGE SPOILS CONTAINING MERCURY,
Kitakyushu Municipal Port and Harbor Bureau, Fukuoka (Japan).
For primary bibliographic entry see Field 5G.
W78-08367

DREDGED MATERIAL DENSIFICATION AND TREATMENT OF CONTAMINATED DREDGED MATERIAL,
Army Engineers Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
C. C. Calhoun, Jr.
In: Management of Bottom Sediments Containing Toxic Substances; Proceedings of the Second U.S.-Japan Experts' Meeting--October 1976, Tokyo, Japan. Report No. EPA-600/3-77-083, July 1977, p 253-265. 1 fig, 3 tab. 1BA608.

Descriptors: *Dredging, *Spoils, *Waste treatment, *Waste disposal, *Dewatering, Densification, Sediments, Slurries, Alabama, Army Corps of Engineers, Flocculation.

U.S. Army Corps of Engineers laboratory and field studies of dewatering dredging spoils and treating contaminated dredged material are reviewed. Fine-grained material dredged from harbors and waterways and placed into containment areas in slurry form retains high water content for years. Removal of the water would extend the service life of such areas at great savings. The purpose of densification (dewatering) is to gain additional disposal area volume, therefore, and not to stabilize the site. Field demonstrations are being carried out at the Upper Polecat Bay disposal area, Mobile, Alabama. Densification techniques under consideration include conventional gravity drainage, mechanical agitation, electro-osmosis, crust management, aeration, frost action, wicks, and vegetation. Other aspects are the applicability of conventional wastewater treatment methods to contaminated dredged material, the association of oil and grease contamination and confined disposal areas, the use of flocculants injecting oxygen and air into pipelines during open-water disposal to increase dissolved oxygen in the water column. (See also W78-08359) (Lynch-Wisconsin)
W78-08374

EFFECTS OF DREDGING ON AQUATIC ORGANISMS--WITH SPECIAL APPLICATION TO AREAS ADJACENT TO THE NORTHEASTERN PACIFIC OCEAN,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
For primary bibliographic entry see Field 5C.
W78-08388

PUTTING WETLANDS TO WORK (CYPRESS DOMES AND PEATLANDS OFFER ECOLOGICALLY SOUND, ENERGY-CONSERVING WASTEWATER DISPOSAL).
National Science Foundation, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08406

A REVIEW OF THE HYDRAULICS OF GRAVITY DRAINAGE, WASTE AND VENT SYSTEMS,
Stevens Inst. of Tech., Hoboken, NJ. Davidson Lab.
For primary bibliographic entry see Field 8B.
W78-08431

PURIFICATION OF WASTE WATERS FOR SUBSOIL IRRIGATION (OCHISTKA STOCHNYKH VOD PRI PODPOCHVENNOM OROCHENII),
N. M. Shevtsov.
Gidrotekhnika i Melioratsiia, No 2, p 44-48, 1978. 1 fig, 2 tab, 6 ref.

Descriptors: *Return flow, *Artificial recharge, *Pipelines, *Irrigation practices, *Path of pollutants, Waste water disposal, Soil disposal fields, Nutrient removal, Waste water treatment, Foreign countries.

Treated waste water from a Russian village is used for subsurface irrigation of farmland by means of a gravitational distribution network of perforated irrigation pipes laid at a depth of 50-55 cm. After refuse, sand, and coarse suspended matter are separated mechanically, the sewage is settled for 2 hrs in two horizontal clarifiers. The treated sewage has a pH of 7.5-8.5, a dissolved solids content of 600-1,500 mg/liter, a suspended solids content of 200-300 mg/liter, a permanganate oxidizability of 274 mg/liter, and a bichromate oxidizability of 480 mg/liter. The waste water is then distributed through the irrigation network at a rate of 1-3 tons/ha/yr. Previous investigations have revealed that silting can reduce the free cross-section of the underground irrigation pipes by as much as 20-25% during the irrigation period. The organic matter is almost completely mineralized by the next irrigation period and the soluble components are washed out. This has resulted in a 4% net reduction in the free cross-section of the irrigation pipes over 8 yrs. These findings suggest that underground irrigation networks may have a lifespan as long as 50 yrs. (Takacs-FIRL)
W78-08432

SLUDGES AND SIDESTREAMS GO HAND-IN-HAND,
Camp Dresser and McKee Inc., Walnut Creek, CA.
For primary bibliographic entry see Field 5D.
W78-08439

HEAVY METALS IN WASTE WATERS FROM THE CITY OF ZURICH (SCHWERMETALLE IN DEN ABWAESSERN DER STADT ZUERICH),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewasserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5A.
W78-08443

AN OVERVIEW OF LAND TREATMENT FROM CASE STUDIES OF EXISTING SYSTEMS,
Cold Regions Research and Engineering, Lab., Hanover, NH.
A. Uiga, and R. Sletten.
Journal Water Pollution Control Federation, Vol. 50, No. 2, p 277-285, February, 1978. 3 fig, 3 tab, 16 ref.

Descriptors: *Irrigation practices, *Return flow, *Sewage disposal, *Crops, *Nutrient removal, Nitrates, Phosphorus, Irrigation effects, Precipitation(Atmospheric), Climatic zones, Waste water treatment, Municipal wastes.

Four land application systems of waste water disposal are discussed with respect to the varying climatic conditions the systems encounter. Untreated and undisinfected municipal wastes from Calumet, Michigan, averaging 1.2 mgd annually, are applied by rapid infiltration to percolation basins. Calumet's average annual temperature is 4.4 C with a total yearly precipitation of 5,380 mm. Primary, undisinfected effluent from Quincy, Washington, is applied at rates up to 15 cm/wk to four cropped fields and one fallow field by open ditch gravity distribution. The annual temperature in Quincy averages 9.4 C with an annual rainfall of 200 mm. Manteca, California, wastes receive secondary treatment without disinfection and are applied at a rate of 45.0 mm/wk by flooding to a 160-acre site covered with reyegrass. Temperatures in Manteca average 16.1 C with a yearly precipitation of 280 mm. At the fourth site in Livermore, California, treated effluent is applied from April to October to a municipal golf course, to land adjacent to the airport runways, and to crops. Applications of 13.0 mm to half of 100-acre golf course every other day, 610-910 mm/season to 45 acres of crops, and 13.0 mm/day for 2-4 wks to 55 acres of adjacent runway land are performed over the season. Temperatures in Livermore average 15 C with an annual rainfall of 380 mm. Land application of waste water in Calumet and Livermore efficiently removed all detectable phosphorus while levels remained high tin the soil waters at the Quincy and Manteca sites. Nitrate-nitrogen concentrations at the four sites were on the average below 10 mg/liter nitrate. Trace metal accumulations were low in all four sites due to the absence of industrial wastes. Cost data and specific site problems were also discussed. (Lisk-FIRL)
W78-08446

50 YEARS' EXPERIENCE OF SLUDGE DEWATERING.
Water Services, Vol. 81, No. 975, p 292-293, May, 1977.

Descriptors: *Sewage sludge, *Dewatering, *Sludge treatment, Equipment, *Filters, Drying, Separation techniques, Design data, Construction materials, Waste water treatment, Sludge disposal, Waste water treatment.

Sludge dewatering techniques developed over a 50-yr period by Edwards and Jones Ltd. of Stoke-on-Trent, England, are discussed. The plate filter press, developed 50 yrs ago, was completely mechanized in the 1960's and fitted with steel-reinforced molded rubber trays and push button operation. Polymer applications to sludge were investigated as an alternative to ferric sulfate, aluminum chlorohydrate, and lime conditioning. A patented in-line polymer dosing apparatus that did not require separate pumping equipment was designed by Edwards and Jones Ltd. Modification of the belt press, which produces a sludge cake with a high solids content, resulted in the development of the continuous filter press. This press provides the high pressure of the plate press within the design of the belt press and is suitable for liquid-solid separation of most wates. The continuous filter press is reportedly easily integrated into an on-line continuous sludge dewatering system. (Lisk-FIRL)
W78-08447

RESULTS OF INVESTIGATIONS OF OPERATION TECHNIQUES, OPERATIONAL SAFETY, TECHNOLOGY AND ECONOMICS OF THE BIOREACTOR FOR SEWAGE SLUDGE ROTTING (ERGEBNISSE DER UNTERSUCHUNGEN UEBER BETRIEBSTECHNIK, BETRIEBASSICHERHEIT, TECHNOLOGIE UND WIRTSCHAFTLICHKEIT AM BIOREAKTOR ZUR ABWASSERSCHLAMMVERROTTUNG),
Bayerisches Landesamt fuer Umweltschutz Munich (West Germany).
R. Woerle.
Muell und Abfall, Vol. 10, No. 1, p 12-19, 1978. 6 fig, 3 tab.

Descriptors: *Sludge treatment, *Fertilizers, *Sludge digestion, *Pulp wastes, *Sewage treat-

ment, Aeration, Operation and maintenance, Design data, Equipment, Municipal wastes, Biological treatment, Waste water treatment, Waste water disposal, Sludge disposal.

The performance of a pilot-scale aerated bioreactor to produce compost from sewage sludge and sawmill wastes was evaluated. Reactor performance was examined during three phases, including: charging of the reactor; operation with complete product return and continuing aeration; and steady-state operation with discharge, partial product return, and addition of fresh sewage sludge and sawdust. A carbon-to-nitrogen quotient of 31-33, the optimum level for the composting process, was maintained by adequate mixing of the sludge and sawdust. Temperature and carbon dioxide concentrations in different reactor zones correlated well with biological processes, indicating that these parameters could be used as control variables for oxygen input. Tests on the effects of raw and cured compost on the growth of cress revealed that curing for aproximately two months in the bioreactor would significantly enhance the fertilizer value and thereby improve plant growth. (Takacs-FIRL)
W78-08449

CAN CALIFORNIA COPE WITH ITS MOUNTING SLUDGE VOLUMES,
California Office of Water Recycling, Sacramento.
K. L. Wassermann.
Civil Engineering-ASCE, Vol. 48, No. 2, p 60-65, February, 1978. 2 fig.

Descriptors: *Sludge treatment, *Sludge disposal, *California, *Treatment facilities, *Irrigation practices, Outlets, Outfall sewers, Incineration, Dewatering, Drying, Waste water treatment, Municipal wastes.

Alternatives to ocean disposal of sewage sludge from the major metropolitan areas in California were investigated by the Los Angeles/Orange County Metropolitan Area project and the San Francisco Bay Regional Wastewater Solids Study. The Los Angeles Hyperion Treatment Plant discharges 1.2 mgd of sludge through a 7 mile long outfall to a submarine canyon. The 40 acres of land formerly employed by the Los Angeles County Sanitation District for winnows in the composting of sludge are required for plant expansions. The San Francisco Bay area disposes of 55% of its sludge in landfills, 30% in storage lagoons, 10% by incineration, and 5% as soil conditioner. Ocean disposal of sludge in California has been banned by 1980 and real estate costs are becoming prohibitive. An estimated 16,000 acres of farmland would be required for land application of all the sludge produced. Anaerobically digested sludge, dewatered to 20% solids content, can be composted and sold for domestic and commercial landscaping. Sludge must have a 25-40% solids content for efficient combustion; thermal processing can produce polychlorinated biphenyls and vaporized mercury as well as other air pollutants. Improved thermal processing techniques are under investigation. Pyrolysis of sludge generates gases which can be used as a fuel source in plant operations but pilot plant studies have indicated problems with the technique. (Lisk-FIRL)
W78-08456

S. HANTS' SEWAGE GIANT.
Surveyor, Vol. 151, No. 4473, p 8-9, March, 1978.

Descriptors: *Outfall sewers, *Treatment facilities, *Pumping plants, *Design data, *Sludge disposal, Waste water disposal, Storm water, Settling basins, Culverts, Concrete structures, Construction materials, Waste water treatment, Incineration, Dewatering, Municipal wastes, Regional development.

The regional sewage treatment facility and outfall planned for the communities of South Hampshire, England, are detailed. The sewer system will treat wastes from six districts and will have an ultimate capacity for servicing a population of 940,000. The first of four stages of construction includes: inlets and screw pumps, screens, coarse solids channels, six primary and storm water settling tanks, four parallel streams with diffused aeration, and four final settling tanks. Belt press dewatering of the sludge will be followed by fluidized bed incineration in a brick rather than asbestos building to reduce noise. The 5-km long outfall with a 3-m diameter will be constructed in a precast concrete culvert and will extend 1,000 m into the Lee-on-Solvent. The plant will have a capacity of 57 mgd with provisions for treating up to 5.5 times the dry weather flow with primary settling. Gravity sewers will transport sewage flows from the eastern and western sections of the region to a pumping station where they will be combined, lifted, and passed by gravity sewers to the treatment plant. The total cost of the completed project is estimated to be 95 million pounds sterling. (Lisk-FIRL)
W78-08458

PROTON BINDING IN FULVIC ACID EXTRACTED FROM SEWAGE SLUDGE-SOIL MIXTURE,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
For primary bibliographic entry see Field 5A.
W78-08462

ANIMAL DISEASE HAZARDS OF SLUDGE DISPOSAL TO LAND: OCCURRENCE OF PATHOGENIC ORGANISMS,
Northumbrian Water Authority, Gosforth (England).
For primary bibliographic entry see Field 5C.
W78-08463

SOIL PERCOLATION TESTS IN THE LAGOS AREA,
Lagos Univ. (Nigeria).
For primary bibliographic entry see Field 5B.
W78-08464

AMMONIA VOLATILIZATION FROM SEWAGE SLUDGE APPLIED IN THE FIELD,
Guelph Univ., (Ontario). Dept. of Land Resources Science.
E. G. Beauchamp, G. E. Kidd, and G. Thurtell.
Journal of Environmental Quality, Vol. 7, No. 1, p 141-146, January-March, 1978. 4 fig, 4 tab, 10 ref.

Descriptors: *Ammonia, *Nitrogen, *Volatility, *Sewage disposal, *Sludge digestion, Analytical techniques, Soil profiles, Air pollution, Waste water treatment, Waste water disposal, Municipal wastes.

The volatilization of ammonia-nitrogen from sewage sludge applied over a circular 0.405-hectare area was measured. The sewage sludge was applied at rates of 116,480 and 134,400 kg/hectare; ammonia flux was measured over periods of 5 and 7 days, respectively. Aerodynamic data was obtained at heights of 10, 50, 100, and 150 cm above the sewage application area. The sewage sludge applications monitored over the 5 day period contained 150 kg/hectare ammonia-nitrogen while the 7 day measurement period recorded volatilization of sewage sludge bearing 89 kg/hectare. Ammonia-nitrogen flux measurements were calculated according to the quantity of ammonia molecules carried through a vertical zone by horizontal air movement. Ammonia flux peaked daily around noon, decreasing exponentially with time. Ammonia volatilization was estimated during the 5 day measurement period at 60% or 90.9 kg of ammonia lost/hectare. In the 7 day experiment, 56% or 50.3 kg/hectare of the ammonia was volatilized. Air temperature within two or three days of application was found to affect the rate of ammonia flux. Actual ammonia-nitrogen levels in the sludge and soil layers varied significantly from predictions. (Lisk-FIRL)
W78-08465

PHOSPHATE FERTILIZING EFFECT OF SLUDGE FROM DOMESTIC SEWAGE PURIFICATION WITH PHOSPHATE PRECIPITATION (ZUR PHOSPHATDUENGEWIRKUNG VON SCHLAEMMEN AUS DER KOMMUNALEN ABWASSERREINIGUNG MIT PHOSPHATFAELLUNG),
Hoechst A.G., Huerth/Knapsack (West Germany).
D. Gleisberg, and N. Taubel.
Wasser und Boden, Vol. 30, No. 1, p 5-8, 1978. 3 fig, 6 tab, 8 ref.

Descriptors: *Phosphorus, *Chemical precipitation, *Fertilizers, *Soil amendments, *Nutrient removal, Soils, Plant growth, Phosphates, Ultimate disposal, Sludge disposal, Waste water treatment, Waste water disposal.

The phosphate fertilizer value of sludge from municipal waste water treatment plants using alum and iron sulfates for phosphate precipitation was measured in greenhouse and field studies with lettuce, spinach, and corn plants. The phosphate content of the sludge was 18.8-28.5%, compared to 9.4% for untreated sewage sludge and 28.5% for calcined phosphate. For sludge obtained after phosphate precipitation, 12.3-20.5% of the phosphate was soluble in citric acid, 12.5-26.7% in citrate, and 0.1-0.39% in water. There were no significant differences in terms of trace element content between untreated sludge and that obtained after phosphate precipitation. Greenhouse studies revealed the advantages in terms of fertilizer value of using sludge from phosphate precipitation instead of untreated sludge to amend lettuce and spinach crops grown in acidic and neutral soils. The effect of the sludge was comparable to that of calcined phosphate. Neither the phosphate precipitation sludge nor the calcined phosphate enhanced plant growth in a loamy sand at pH 3.8. Field tests with corn demonstrated that soil amendments with phosphate precipitation sludge would not significantly affect the trace element content of the corn-cobs. (Takacs-FIRL)
W78-08471

PERSISTENCE OF ENTEROVIRUSES IN SEWAGE SLUDGE,
Ontario Ministry of Health, Toronto. Lab. Services Branch.
For primary bibliographic entry see Field 5A.
W78-08472

INAPPLICABILITY OF BATCH KINETIC DATA TO ANALYSIS OF SOIL TREATMENT SYSTEMS,
Kennedy Engineers, Inc., San Francisco, CA.
R. M. Adams.
Journal Water Pollution Control Federation, Vol. 50, No. 2, p 385-389, February, 1978. 1 fig, 14 ref.

Descriptors: *Return flow, *Irrigation practices, *Kinetics, *Waste water disposal, *Soil types, Mathematical models, Analytical techniques, Biochemical oxygen demand, Waste water treatment, Municipal wastes.

Mathematical models were unsuccessful in describing the kinetics of biochemical removal of organic carbon by plug flow through soil columns. An equation for calculating hydraulic retention time of a constant-density liquid is integrated with the initial and final reactant concentration. To calculate the residence time in a differential plug flow reactor, the flow streamline length, the liquid fraction, and the water velocity are considered as a function of the soil and waste water COD, the streamline flow distance, and the rate of COD

removal. Activated sludge samples containing 330 mg/liter COD were filtered through packed soil columns; results were compared to batch anaerobic incubation data for COD reduction. The cell residence time equation was applicable only in designing plug flow systems where reaction rates were dependent upon concentrations and reactions involving only single chemical species. Batch incubation experiments provided unreliable COD reduction data in the soil columns because of spatial variations of the microorganism types in the soil. The batch data cannot, therefore, be utilized in soil treatment system designs. (Lisk-FIRL)
W78-08484

INFECTIOUS DISEASE HAZARDS OF LAND-SPREADING SEWAGE WASTES,
Agricultural Research Service, Beltsville, MD. Biological Waste Management and Soil Nitrogen Lab.; and Agricultural Research Service, Beltsville, MD. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5C.
W78-08490

RIVER WATER QUALITY IN ESSEX DURING AND AFTER THE 1976 DROUGHT,
Essex Water Co., (England).
For primary bibliographic entry see Field 5B.
W78-08491

THE MOVEMENT OF SEWAGE EFFLUENT THROUGH SOIL COLUMNS: THE MAJOR IONS (NA, CA, MG, CL, AND SO4),
Saskatchewan Univ., Saskatoon. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W78-08492

SPRAY IRRIGATION OF DOMESTIC SEWAGE IN THE BRAUNSCHWEIG SEWAGE ASSOCIATION - ENVIRONMENTAL POLLUTION OR SUCCESSFUL UTILIZATION OF SEWAGE. (DIE VERREGNUNG VON KOMMUNALEM ABWAESSERN IM ABWASSERVERBAND BRAUNSCHWEIG - UMWELTVERSCHMUTZUNG ODER SINNVOLLE ABWASSERVERWERTUNG),
Kiel Univ. (West Germany). Inst. fuer Wasserwirtschaft und Meliorationswesen.
For primary bibliographic entry see Field 5B.
W78-08493

NEW PROSPECTS FOR SEWAGE DISPOSAL IN U P,
Irrigation Commission, Lucknow (India).
A. C. Chaturvedi.
Journal of the Institution of Engineers (India), Vol. 58, Part EN 1, p 21-22, October, 1977.

Descriptors: *Water quality control, *Pollutant identification, *Pollution abatement, Surveys, *Lowflow augmentation, River basins, River basin development, Treatment facilities, Organic wastes, Protein, Carbohydrates, Eutrophication, Nutrients, Water utilization, Diseases, Waste water treatment, Municipal wastes, Sewage disposal.

Sources of water pollution in Uttar Pradesh, India, are identified and water quality controls are cited. The discharge of sewage effluents to rivers, ponds, and lakes has overburdened the natural self-purification process of receiving waters. Surveys have indicated that waste water treatment facilities should be expanded or replaced; further research on pollutant identification and water basin management is recommended. Identification of a water resource's use is required for the cost-effective evaluation of the need for treatment facilities, reservoirs, sewer systems, and control regulations. Trace quantities of pollutants have been identified as leading to hematopoitetic tissue. More strict control of halogenated methanes and chloroforms in receiving waters is needed; organic components in domestic wastes have been classified as carbohydrates, proteins, fatty acids, and soluble organic materials evident in trickling filter effluent. Effective water quality management includes establishing standardized rating scales, information resources, nutrient requirements of aquatic flora, and cost-effective alternatives of waste water treatment projects. (Lisk-FIRL)
W78-08500

A SHORT TERM STUDY ON THE POLLUTION OF TAPTI RIVER IN SURAT REGION,
S. V. Regional Coll. of Engineering and Technology, Surat (India).
For primary bibliographic entry see Field 5A.
W78-08504

FRESH WATER FROM SEWAGE ON LONG ISLAND,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
For primary bibliographic entry see Field 5D.
W78-08515

BACTERIAL AEROSOLS RESULTING FROM SPRAY IRRIGATION WITH WASTEWATER,
Army Medical Bioengineering Research and Development Laboratory, Fort Detrick, MD.
For primary bibliographic entry see Field 5A.
W78-08518

WASTEWATER DISPOSAL FROM TWO-DIMENSIONAL DIFFUSER,
Democritos Univ. of Thraki, Xanthi (Greece). School of Engineering.
N. E. Kotsovinos.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Technical Notes, Vol 104, No HY4, p 559-561, April 1978. 1 fig, 3 ref.

Descriptors: *Waste water disposal, *Jets, *Mathematical models, *Hydraulic structures, Flow, Buoyancy, Model studies, Diffusion, Tracers, Spatial distribution, Mathematical studies, Analytical techniques, Analysis, Thermal pollution, Two-dimensional diffuser, Tracer concentration, Buoyant jets.

In the design of a multiport diffuser structure to dispose sewage of waste heat (thermal pollution) in the open sea, the engineer wants to calculate the time-average center line concentration of the pollutant (or heat) for various initial densimetric Froude numbers. The purpose of this note was to present an explicit equation that gives the center line dilution in a line vertical buoyant jet (physical model of the discharge effluent) for any initial Froude number. The experimental data for all buoyant jets (for any Froude number F in the range 1 less than F less than infinity, and for any nondimensionsl distance X/D greater than 10) followed a universal curve. Therefore, the note advocated a useful formula for the design engineer. (Humphreys-ISWS)
W78-08567

BILGE WATER DISPOSAL SYSTEM INCLUDING OIL RECOVERY MEANS,
National Marine Service, Inc., St. Louis, MO. (Assignee).
For primary bibliographic entry see Field 5G.
W78-08608

WASTE DISPOSAL SYSTEM FOR CHEMICAL PLANTS,
Hitachi, Ltd., Tokyo (Japan).
For primary bibliographic entry see Field 5D.
W78-08611

INCINERATION OF ALKALINE WASTE LIQUORS,
Badische-Anilin und Soda-Febrik A.G., Ludwigshafen am. Rhein (West Germany).
K. Schloemer.
International Chemical Engineering, Vol. 18, No. 2, p 204-208, April, 1978. 4 fig, 1 tab.

Descriptors: *Incineration, *Alkaline water, *Chemical wastes, *Alkalis(Bases), *Venturi flumes, Sodium, Design data, Construction materials, Linings, Corrosion control, Water vapor, Waste water treatment, Waste water disposal, Industrial wastes.

Incineration was considered for alkaline waste liquors that are nondegradable or contain elements toxic to microorganisms. Biological degradation, clarification, and waste sulfuric acid treatment were eliminated because of the high costs of installation and operation. High-temperature incineration of the alkaline waste waters at 1,000-1,100C without steam production was elected over low-temperature fluidized-bed incineration with steam production and high temperature combustion with steam production. A vertical, refractory-lined combustion chamber with temperatures of 1,000-1,600C in the upper selection was used. The soda produced during incineration was conveyed to an immersion bath were exhaust gas was cooled; molten soda was dissolved and removed; and dust in the exhaust gas was partially precipitated. Approximately 90-95% of the soda was removed in the immersion bath; the exhaust gas was cooled to 90C and the residual soda was reduced to 80 mg/cu m by a wet Venturi scrubber. The water-saturated exhaust gas was discharged at 80C through a 30 m high stack. (Lisk-FIRL)
W78-08613

OIL WELL OPERATION AND SALT-WATER INTRUSION: POLICY IMPLICATIONS,
Cities Service Oil Co., Charleston, WV.
For primary bibliographic entry see Field 5G.
W78-08617

BIO-SOLIDS DEWATERING AND DISPOSAL AT A SULPHITE MILL,
Edde (Howard), Inc., Bellevue, WA.
For primary bibliographic entry see Field 5D.
W78-08620

COPRECIPITATION OF ACID CHEESE WHEY AND TANNERY WASTE AND RECOVERY OF PROTEIN,
Agricultural Research Service, Philadelphia, PA. Eastern Regional Research Center.
For primary bibliographic entry see Field 5D.
W78-08626

THE PRINCIPLES AND METHODS OF CHROMIUM RECOVERY IN THE TANNERY,
Allied Chemical Corp., Morristown, NJ. Industrial Chemicals Div.
For primary bibliographic entry see Field 5D.
W78-08627

CONSIDERATIONS RELATING TO TOXIC SUBSTANCES IN THE APPLICATION OF MUNICIPAL SLUDGE TO CROPLAND AND PASTURELAND (A BACKGROUND SUMMARY),
Environmental Protection Agency, Washington, DC. Office of Toxic Substances.
For primary bibliographic entry see Field 5B.
W78-08651

DISPERSION STUDY OF BURIED ELEMENTAL MERCURY,
Du Pont de Nemours (E. I.) and Co., Aiken, SC. Savannah River Lab.
E. G. Orebaugh, and W. H. Hale, Jr.

Available from the National Technical Information Service, Springfield, VA 22161 as DP-1401, Price codes: A03 in paper copy, A01 in microfiche. Report DP-1401, UC-41, July 1976, 44 p, 7 fig, 1 tab, 21 ref.

Descriptors: *Mercury, *Metals, Soil analysis, Soil chemistry, *Soil contamination, *Soil environment, Chemical analysis, Translocation, Public health, *Water supply, Model studies, Waste disposal, Waste dumps, Environmental effects, Path of pollutants, *Mercury transport, *Mercury flux, Buried mercury, Four Mile Creek.

Waste elemental mercury disposed of by burial in trenches has been found to have no probable environmental effects. (This method of disposal has been discontinued). Transport modes by which buried mercury would be expected to reach man in the environment were modeled mathematically using experimentally determined and estimated parameters. Calculations established that elemental mercury is the stable chemical form in the soil matrix. Consequently, only diffusion of mercury vapor to the atmosphere and transport of mercury in soil water to the water table merited consideration. Aqueous transport occurs by both dissolution of mercury in water (maximum = 57 ppb) and suspension of mercury on oxide colloids of iron and silicon in soil water (maximum = 6 ppm). This study indicated that colloidal suspension is the dominant mode for transport of mercury from the burial site. By this means, a mercury flux of about 200 mg/hr from about 10 tons of buried mercury may enter the water table and travel horizontally, eventually exiting as surface water. As a worst case, this flux could contribute approximately 0.2 ppb to nearby Four Mile Creek, which is near the range of natural mercury levels in fresh water streams and lakes. (EIS-Katz)
W78-08655

MIGRATION OF EXPLOSIVES AND CHLORINATED PESTICIDES IN A SIMULATED SANITARY LANDFILL,
Construction Engineering Research Lab. (Army). Champaign, IL.
For primary bibliographic entry see Field 5B.
W78-08656

UTILIZATION OF SWINE MANURE IN A POLYCULTURE OF ASIAN AND NORTH AMERICAN FISHES,
Illinois Natural History Survey, Kinmundy.
For primary bibliographic entry see Field 5C.
W78-08694

IRRIGATION WASTEWATER DISPOSAL WELL STUDIES-SNAKE PLAIN AQUIFER,
Idaho Dept. of Water Resources, Boise.
For primary bibliographic entry see Field 5B.
W78-08724

LAND APPLICATION OF SELECTED HOME WASTEWATER,
Metcalf and Eddy, Inc., Boston, MA.
B. P. Popkin.
American Society of Agricultural Engineers, ASAE Technical Paper No. 78-2062, 1978 20 p, 11 tab, 1 fig, 32 ref.

Descriptors: *Supplemental irrigation, *Waste water disposal, *Water conservation, *Sewage treatment, Cost analysis, Water reuse, Water costs, Drainage, Southwest U.S., Consumptive use, Water quality, Irrigation water, Gray water, Agricultural engineering.

Application of selected home wastewater (gray water) is reviewed for domestic irrigation of lawns and gardens in the arid Southwest. Conditions may be considered favorable where there are high sewage-treatment and drinking-water costs, as well as accessibility to loamy, well-drained, cropped soils. Quality and quantity of gray water are suitable for such irrigation purposes if climate, soil conditions, plant needs, and engineering problems are taken into account. Costs are compared for most gray water and laundry-effluent reuse for 4 cases: a 100-unit trailer park, a 50-unit apartment complex, a double family home of 6, a single family home of 3. The economics of wastewater reuse is favorable under the limited conditions of large-scale units and high water and sewer user fees, conditions which do exist in the Southwest U.S. (Popkin-Arizona)
W78-08759

BRIGHTON'S SEWAGE GOES TO SEA.
For primary bibliographic entry see Field 5D.
W78-08765

INFRARED SLUDGE INCINERATORS OPERATIONAL IN TEXAS SEWAGE PLANT.
Water and Wastes Engineering, Vol. 15, No. 2, p 23, February, 1978. 1 fig.

Descriptors: *Incineration, *Infrared radiation, *Sludge disposal, *Construction materials, *Conveyance structures, Dewatering, Operation and maintenance, Drying, Ultimate disposal, Waste water treatment, Sludge treatment, Municipal wastes.

A patented infrared sludge incineration process, designed by Shirco, Inc. of Dallas, Texas, has been installed in the Richardson, Texas, sewage treatment plant. Sewage sludge is transported on woven wire belts through two horizontal, insulated incinerators, each 8.5 by 72 ft. The sludge, which is fed into the unit through a feed hopper, is pressed to 1-inch thickness by an internal roller before it is passed into the incinerators. Within the chambers, infrared heating elements incinerate the sludge at a rate of 2,400 lbs/hr. Gas is heated over the ash produced as it passes counter-current to the incoming sludge. The ash is removed for further handling. The modular incineration system has a 1-1/2 hr start up or shut down time. (Lisk-FIRL)
W78-08776

THAMES WA OUTLINES ITS COST STUDY ON SLUDGE.
For primary bibliographic entry see Field 5D.
W78-08777

5F. Water Treatment and Quality Alteration

ARIZONA'S WHITE RIVER - A WORKING WATERCOURSE,
Arizona State Historical Society, Tucson.
L. Davisson.
The Journal of Arizona History, Vol 19, No 1, p 55-72, Spring, 1978. 42 ref.

Descriptors: *Arizona, History, River basin development, Irrigation practices, *Indian reservations, Water supply, Water utilization, Dams, Water pumping, Water rights, Recreation, *Water resources development, Crop production, Livestock, Bridge construction, Arid lands, *Water conservation, Land management.

Research summarizes historic and present day use of the White River Valley, located in central Arizona. Today the White Mountain Apaches utilize the river's water supply to irrigate crops of corn, fruit, alfalfa and vegetables and to provide water for livestock. Since 1954 the White Mountain Recreation Enterprise has constructed a series of lakes on the Indian reservation which have become popular camping and fishing spots. Federal fish hatcheries have been developed jointly by the White Mountain Tribe and the U.S. Bureau of Sports Fisheries and Wildlife. A large portion of the tribal income is derived from annual sale of fishing, hunting and camping permits to visitors. Carful water conservation and protection of natural resources in this arid environment are responsible for the successful White Mountain Apache enterprises. (Jewkes-Arizona)
W78-08372

THE COST OF WATER SUPPLY AND WATER UTILITY MANAGEMENT (VOLUMES I AND II),
Municipal Environmental Research Lab., Cincinnati, OH. Water Supply Research Div.
For primary bibliographic entry see Field 5G.
W78-08390

HUMAN PATHOGENS AS POTENTIAL HEALTH HAZARDS IN THE REUSE OF WATER,
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark). Dept. of Virology and Immunology.
E. Lund.
Ambio, Vol. 7, No. 2, p 56-61, 1978. 4 tab, 7 ref.

Descriptors: *Pathogenic bacteria, *Disinfection, *Mycobacterium, *Protozoa, *Viruses, Diseases, Potable water, Chlorination, Trickling filters, Biological treatment, Lime, Waste water treatment, Municipal wastes.

Methods of removing pathogenic bacteria, viruses, protozoa, and helminths from waste water are reviewed. Salmonella and E. coli are reduced by 50% with primary and mechanical treatment. Parasitic ova and amoebic cysts are removed only through sedimentation in primary or secondary clarifiers. Trickling filter systems, depending on climatic conditions and facility design, can reduce E. coli, salmonella, and sometimes viruses from 10,000,000-1,000,000 bacteria/100 ml to 10,000-100,000/100 ml; Clostridium perifringens are relatively unaffected. A pH of 10.5-11.0, induced by chemical treatment with lime, disinfects treated water but does not reduce mycobacteria or vibrio cholera. Chlorination of sewage effluent effectively kills bacteria, salmonella, Clostridium perfringens, and mycobacteria with adequate contact time but does not destroy enteric viruses and parasitic eggs. Bacteria and viruses in drinking water are effectively removed by chlorination. Pasteurization or irradiation may reduce the concentrated microorganisms contained in primary and digested sludges. (Lisk-FIRL)
W78-08435

IS CHLORINE THE BEST DISINFECTANT.
The American City and Country, Vol. 93, No. 3, p 82-83, March, 1978. 1 fig.

Descriptors: *Chlorination, *Disinfection, *Ozone, *Ultraviolet radiation, *Bromine, Halogens, Toxicity, Viruses, Bactericides, Viricides, Iodine, Sulfur compounds, Chlorine, Waste water treatment, Municipal wastes.

Dechlorination ozonation, chlorine dioxide, ultraviolet light, bromine chloride, and iodine are investigated as alternative disinfectants to chlorine which has been found toxic to some aquatic organisms, to form carcinogenic halogenated organic compounds, and to pose a potential health hazard in transport and in storage. Dechlorination with sulfur dioxide can reduce the pH and dissolved oxygen content of the effluent, which then requires further treatment before discharge. Ozonation is a more costly procedure than chlorination but it is not toxic to aquatic organisms, assists in increasing the dissolved oxygen content, and provides adequate disinfection. Contractors under investigation for ozonation include baffled diffusers, positive-pressure injection systems, turbine contactors, bubble diffusers, and multi-stage mixing pumps. Chlorine dioxide disinfection requires on-site generation equipment. While

chlorine dioxide does not form halogenated compounds, does not react with ammonia in the waste water, and disinfects efficiently and selectively at high pH levels, it is more toxic than chlorine. Ultraviolet light disinfection is efficient at high doses, produces no toxins, and can disinfect turbid or colored water. Bromine chloride, which forms bactericidal and viricidal bromines when reacted with ammonia, produces some monohalogenated compounds which are more degradable than chlorinated compounds. Bromine chloride disinfection also has the advantage of rapidly killing poliovirus. Iodine disinfection, currently under investigation, is considered prohibitively expensive. (Lisk-FIRL)
W78-08455

THE OXFAM SANITATION UNIT,
Oxfam, Oxford (England).
For primary bibliographic entry see Field 5D.
W78-08457

A CHLOROFORM PROBLEM AT GREAT WARFORD AND ITS SOLUTION,
Allott and Lomax, Manchester (England).
For primary bibliographic entry see Field 5D.
W78-08459

TEEPOL AND TRITON MEDIA FOR THE ENUMERATION OF ESCHERICHIA COLI BY MEMBRANE FILTRATION,
Dundee Univ. (Scotland). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-08476

COMPARISON OF ADSORPTION ELUTION METHODS FOR CONCENTRATION AND DETECTION OF VIRUSES IN WATER,
Hadassah Medical School, Jerusalem (Israel). Environmental Health Lab.
For primary bibliographic entry see Field 5A.
W78-08477

DETERMINATION OF TOCL BY ENRICHMENT ON POWDERED ACTIVATED CARBON AND FLOCCULATION (UNTERSCHUNGEN ZUR BESTIMMUNG DE ORGANISCH GEBUNDENEN CHLORS MIT HILFE EINES NEUARTIGEN ANREICHERUNGSVERFAHREN),
For primary bibliographic entry see Field 5A.
W78-08478

CHLORINATION: ASSESSING ITS IMPACT,
For primary bibliographic entry see Field 5C.
W78-08498

EFFECT OF GAMMA RAYS ON MICROORGANISMS AND CHEMICALS IN WATER, WASTEWATER, AND SLUDGE,
Florida Inst. of Tech., Melbourne. Univ. Center for Pollution Research.
For primary bibliographic entry see Field 5D.
W78-08503

MASS TRANSFER AND REACTION RATE STUDIES OF OZONATED MUST WASTEWATERS IN THE PRESENCE OF SOUND WAVES,
Arizona Univ., Tucson. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W78-08512

PROCESS FOR CHELATING AND INHIBITING SCALE IN AQUEOUS SYSTEMS,
Petrolite Corp., St. Louis, MO. (Assignee).
P. M. Quinlan.
U.S. Patent No. 4,064,044, 10 p, 3 tab, 14 ref; Official Gazette of the United States Patent Office, Vol 965, no 3, p 1049, December 20, 1977.

Descriptors: *Patents, *Scaling, *Descaling, *Water softening, Industrial water, *Chelation, *Water treatment, Chemical reactions, Organic compounds.

A process for inhibiting scale such as calcium, barium and magnesium carbonate, sulfate, silicate, etc. is described which comprises employing threshold amounts of methylene phosphonates of polyalkylenepolyamines polymerized with epoxyhalides or dihalides. These products are the reaction products of (1) polyalkylene polyamines and related compounds with (2) polyfunctional compounds, preferably bifunctional, capable of yielding upon reaction (3) a polymer having controlled crosslinking so that the polymer is soluble and/or dispersable in an aqueous system, and then reacting this polymer with a phosphomethylolating agent to yield (4) methylene phosphonates of polymerized polyalkylenepolyamines. (Sinha-OEIS)
W78-08589

WATER CLEANER,
For primary bibliographic entry see Field 5G.
W78-08592

ALGAE GROWTH CONTROL,
Algard Pty. Ltd., Balwyn (Australia). (Assignee).
For primary bibliographic entry see Field 5G.
W78-08594

METHOD AND APPARATUS FOR ELECTRO SHOCK DEGERMINATION OF WATER,
Multorgan S. A., Magliaso (Switzerland). (Assignee).
UW. Stark.
U.S. Patent No. 4,066,544, 6 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 966, No 1, p 248, January 3, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, *Disinfection, Bacteria, Oxidation, Equipment, *Electrolysis, Magnetic fields, *Degermination.

A primary object of this invention is to provide a new and improved method of, and apparatus for, killing the bacteria or germs in water by electroshock. In the proposed method the water is exposed to an air-air ion mixture and at the region where there is effective mixture there is produced a magnetic field which penetrates the water. The apparatus comprises an ion generator, the outlet of which is connected with a section of a conduit conducting the water or a vessel containing such water and formed of an electrically insulating material. At the outlet region for the ions there are provided means for generating the magnetic field. (Sinha-OEIS)
W78-08607

PORTABLE WATER FILTRATION DEVICE,
Dynek Corp., Port Chester, NY. (Assignee).
E. Stern.
U.S. Patent No. 4,066,551, 8 p, 11 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 966, No 1, p 251, January 3, 1978.

Descriptors: *Patents, *Water treatment, *Water quality control, *Water purification, *Filtration, Chlorinization, Equipment, Sterization, Portable.

The portable water filtration device may be made in various ways. In one way, the reservoir is formed in a seal-tight housing and the water is pumped by means of an air pump through a filter located within the reservoir and then passed through a spout. In another way, use is made of a blender with the water being forced by an impeller from with a lower compartment of the blender jar into a filter and then out a spout on the filter. Other pump means may also be used to pump the water through a filter and out an outlet from a closed reservoir. Sterilizing means may also be provided in the various ways to sterilize the water prior to filtration. Also, the water being treated may be recycled to increase the time of treatment. (SInha-OEIS)
W78-08610

EFFECTS OF MANGANESE AND THEIR MODIFICATION BY HEXAMETAPHOSPHATE,
Environmental Protection Agency, Cincinatti, OH.
For primary bibliographic entry see Field 5C.
W78-08640

5G. Water Quality Control

PROTECTION OF FISHING WATERS.
For primary bibliographic entry see Field 6E.
W78-08203

SOIL EROSION AND SEDIMENTATION CONTROL ACT OF 1972.
For primary bibliographic entry see Field 6E.
W78-08204

HAMPSON V. SUPERIOR COURT FOR COUNTY OF INYO.
For primary bibliographic entry see Field 6E.
W78-08212

CHESAPEAKE BAY AND TRIBUTARIES.
For primary bibliographic entry see Field 6E.
W78-08215

WATER POLLUTION CONTROL AND ABATEMENT.
For primary bibliographic entry see Field 6E.
W78-08216

CHEMICAL CONTROL OF BRUSH AND ENVIRONMENTAL SAFETY OF ROADSIDE VEGETATION MANAGEMENT CHEMICALS,
Purdue Univ., Lafayette, IN. Dept. of Biological Sciences.
D. J. Morre.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 848, Price codes: A07 in paper copy, A01 in microfiche. Report No. FHWA-IN-76-32, December 1, 1976. 134 p, 29 fig, 22 tab, 71 ref. C-36-48F, HRP - 1(14) Part II.

Descriptors: *Brush control, *Weed control, *2, 4-D, *Herbicides, *2,4,5-T, *Vegetation effects, Environmental effects, Aquatic life, Algae, Fish, Environmental effects, *Roadside vegetation management, Roadside maintenance, Vegetation control, *Krenite, 2,4,-DP, Dicamba, Picloram, Banvel, Tordon, 2,4,5-TP, Silvex, Roadside mowing.

A research project to identify and test a suitable herbicide treatment program (for use on the Interstate System in combination with reduced mowing practices) that would provide a practical alternative to 2,4,5-T and at the same time control broad leaf weeds is presented; one such treatment in the form of a specific recommendation is provided. The herbicide 2,4,5-T, alone or in combination with 2,4-D (brush killer) either as an ester formulation or as an amine salt, applied either as a dormant treatment in winter or to foliage in summer or early fall, is the most effective chemical treatment for control of roadside bursh. Regulatory rulings prohibit the use of 2,4,5-T on home grounds, recreational areas, and in or near water

areas. Discontinuance of the use of 2,4,5-T in roadside applications on the basis of environmental safety should be seriously questioned. Three herbicides were tested: (1) picloram (Tordon), (2) 2,4-D, and (3) dicamba (Banvel). A mixture of equal parts of an amine salt formulation of 2,4-D + 2,4,5-TP (Silvex) + dicamba (Banvel) is recommended for inclusion in the Fall-Spring spraying rotation to be applied by off-road equipment to unmowed portions of the Interstate System. This same mixture or 'Krenite' brush control agent is recommended as a foliar application for control of brush along county roads and other situations where hydraulic spary applications directly to stems and foliage are indicated. Environmental safety of these herbicides was also investigated and is reported. Potential hazards wer minimal if the sprays were used as recommended. Control of herbicide drift is an important aspect of any chemical control of brush. (Seip-IPA)
W78-08224

WATER CONSERVATION AND POLLUTION CONTROL IN COAL CONVERSION PROCESSES,
Water Purification Associates, Cambridge, MA.
D. J. Goldstein, and D. Yung.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 568, Price codes: A21 in paper copy, A01 in microfiche. Report No. EPA-600/7-77-063, June, 1977. 467 p, 96 fig, 154 tab, 280 ref, append. 68-03-2207.

Descriptors: *Electric power, *Electric power production, *Water pollution, *Coal, *Waste water treatment, *Water conservation, *Water demand, *Coal conversion, Coal gasification, Coal preparation, Hygas process, Synthane process, Solvent refined coal, Lurgi process, Western coal.

Results of a study to develop strategies and recommend measures to minimize water pollution and consumption by coal conversion complexes in the Western states are reported. Part I - 'Water Quantities' - gives brief descriptions and process water requirements for nine conversion processes. Detailed designs and analyses are given for Hygas, Synthane, and Solvent Refined Coal (SRC) processes, and for Lurgi combined-cycle power generation. At three proposed sites (in North Dakota, New Mexico, and Wyoming), complete water requirements and effluents, including all mining and related off-site uses, are given for the power, Hygas, and SRC plants. The Synthane process is analyzed only at the Wyoming site. Part 2 - 'Water Treatment' - gives analyses of influent and effluent waters, with examples for study. For the three plants at the North Dakota site, source water of good quality is assumed to be cheap and available. For three plants in New Mexico, souce water will be available but is brackish. All the plants at the Wyoming site receive sewage from a satellite town; additional fresh water is available but is assumed to be expensive. The plants, being net consumers of water, are designed for no discharge of water. For each process at each site (10 cases) an integrated water treatment plant block flow diagram is given with approximate costs and energy requirements. (Seip-IPA)
W78-08228

BROMINE CHLORIDE - AN ALTERNATIVE TO CHLORINE FOR FOULING CONTROL IN CONDENSER COOLING SYSTEMS,
Martin Marietta Corp., Baltimore, MD. Environmental Technology Center.
L. H. Bongers, T. P. O'Conner, and D. T. Burton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 968, Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA-600/7-77-053, May, 1977. 160 p, 12 fig, 26 tab, 71 ref, 6 append. 68-02-2158.

Descriptors: *Bromine, *Bromides, *Chlorine, Electric powerplants, *Thermal powerplants, Fouling, Condensers, *Cooling water, Degradation, Environmental effects, Water pollution effects, Water pollution control, Performance, Estuaries, Pollutant identification, Bromine chloride, *Fouling control, Condenser cooling systems, Estuarine water, Dissipation, Decay rate, Bromine chloride residues, Chlorine residues, Bromamines.

Results of a comparison of bromine chloride (BrCl) and chlorine (Cl) for fouling control in condenser cooling systems are presented; their decay rate in estuarine cooling water and their fouling control effectiveness are evaluated. The program was conducted at an 1100-MWe, fossil-fueled, two-unit generating facility using estuarine water for one-through cooling. The halogens were applied continuously at doses of 0.5 ppm or less. Fouling control was evaluated by observing the accumulation of fouling on glass panels exposed to treated and untreated cooling water, and on condenser performance data. Decay characteristics of the halogens were evaluated by measuring residual oxidant concentrations using an amperometric back-titration method sensitive to 5 ppb. Fouling control resulted from the presence of bromamines expected from the rapid reaction of free hypobromous acid with the ambient levels of ammonia present. Dosing requirements depended primarily on intake cooling water temperature. Using BrCl decay and fouling response to treatment data, a control model was formulated which predicted minimum BrCl dose necessary to attain adequate fouling control. BrCl was effective when dosed continuously at 0.5 ppm and less. Oxidant residuals resulting from BrCl treatment dissipate more rapidly in the estuarine water than the chlorine-induced oxidants. Advantages and disadvantages of continuous and intermittent fouling control strategies are discussed on the basis of biological and environmental considerations. (Seip-IPA)
W78-08247

TRANSURANICS IN NATURAL ENVIRONMENTS.
Energy Research and Development Administration, Las Vegas.
For primary bibliographic entry see Field 5B.
W78-08248

SITE SELECTION AND DESIGN FOR MINIMIZING POLLUTION FROM UNDERGROUND COAL MINING OPERATIONS,
Alabama Univ., University.
R. Q. Shotts, E. Sterett, and T. A. Simpson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 180, Price codes: A06 in paper copy, A01 in microfiche. Report No. EPA-600/7-78-006, January, 1978. 98 p, 40 fig, 16 tab, 33 ref. 68-03-2015.

Descriptors: *Mine drainage, *Coal mines, *environmental effects, *Pollutant identification, *Water quality, *Acid mine water, *Mine water, Underground, *Mining engineering, *Heavy metals, Engineering geology, Soil mechanics, Alabama, Sites, Coal mine development, Underground coal mining, Coal mine site selection, Sulfide oxidation, Cedar Creek(AL).

Discussed are mine site selection, Manner of mine development, method of extraction of coal, and the proper closure of underground coal mines to ensure the minimum pollution of the mine area both during the life of the mine and after abandonment. The study area was the North River Mine in west-central Alabama. Pre-mining environment was assessed by sampling Cedar Creek and other streams. Analyses of samples of groundwater into the mine, of the water pumped from the mine pump, and of water from Cedar Creek below the mine, made possible the assessment of water quality. Principal factors associated with mining which affected downstream water quality were sulfide oxidation and acid formation in the mine, the quality of the groundwater seeping into the mine, the limestone used for rock dusting, and the quality of the resettled but not treated mine and washing plant water. Pollution downstream from the mine was slight, even when untreated mine effluent flowed directly into the creek. Quantities of heavy metal ions contained in the mine influent and effluent were small. If openings are sealed after closure, environmental integrity for the area should exist indefinetely. Deep mines in Alabama's synclinal coalfields, if entered some distance from the outcrop, or mined down-dip if started on the outcrop, should produce little surface pollution. Sealing of all openings should ensure minimum pollution far beyond the life of the mines. (Seip - IPA)
W78-08261

FIELD AND LABORATORY METHODS APPLICABLE TO OVERBURDENS AND MINESOILS,
West Virginia Univ., Morgantown. Coll. of Agriculture and Forestry.
For primary bibliographic entry see Field 5A.
W78-08264

VEGETATIVE STABILIZATION OF SPENT OIL SHALES: VEGETATION, MOISTURE, SALINITY, AND RUNOFF - 1973-1976,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
H. P. Harbert, III, and W. A. Berg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 308, Price codes: A09 in paper copy, A01 in microfiche. Report No. EPA-600/7-78-021, February, 1978. 169 p, 24 fig, 18 tab, 11 ref, 2 append. R-803059.

Descriptors: *Oil shales, *Waste disposal, *Ultimate disposal, *Vegetation establishment, *Plant growth, *Saline soils, *Salt balances, *Salinity, Runoff, Moisture content, Irrigation, Leaching, *Spent oil shales, TOSCO oil shale, Salt transport, Resalination.

To investigate surface stability of and salt movement in spent shales and spent shales covered with soil after vegetation has been established by intensive treatment and then left under natural precipitation conditions, field studies were initiated in 1973 on two types of spent oil shale - coarse-textured (USBM) and fine-textured (TOSCO). Plots were established at low and high-elevation study sites in northwestern Colorado. A good cover of native species was established on all plots by leaching, N and P fertilization, seeding, mulching, and irrigation. The plots have not been irrigated since establishment and now support an adequate cover of vegetation dominated by perennial grasses, with the exception of the low-elevation TOSCO plots which are dominated by a mixture of annuals and perennial grasses. Higher levels of Mo were found in plants grown in the spent shales than in plants grown in soil. Water applied during leaching and establishment was being used by plants during the third growing season; thus, only one year's information for growth under seasonal precipitation is represented. Resalinization occurred following leaching of the TOSCO spent shale; salt moved up into 15 cm of soil cover over leached TOSCO spent shale. USBM spent shale was resalinized at the high-elevation site following inadequate leaching but was not at the low-elevation site. The 30 cm of soil cover over the unleached spent shale was not salinized at either study site. Greatest runoff was from the TOSCO spent shale. Sediment yields were very low reflecting the use of mulch and establishment of adequate plant cover. (Seip-IPA)
W78-08268

MODELING EFFECTS OF AQUATIC PLANTS IN RIVERS.
Ministry of Works and Development, Hamilton (New Zealand).
For primary bibliographic entry see Field 5C.
W78-08300

PROJECTIONS OF PHOSPHORUS LEVELS IN WHITE LAKE,
Hydroscience, Inc., Westwood, NJ.
For primary bibliographic entry see Field 5C.
W78-08304

WATER QUALITY MANAGEMENT IN THE HSINTIEN RIVER IN TAIWAN,
Asian Inst. of Tech., Bangkok (Thailand). Dept. of Environmental Engineering.
B. N. Lohani, and N. C. Thanh.
Water Resources Bulletin, Vol. 14, No. 3, p 689-695, June 1978. 3 fig, 2 tab, 2 ref.

Descriptors: *Water quality control, *Hsintien River(Taiwan), *Chance-constrained programming, *Cost minimization, Programs, Decision making, Cost effectiveness, Probability, Drainage basins, Dissolved oxygen, Biochemical oxygen demand, Optimization, Stochastic processes, Reach(Streams), Treatment facilities, Treatment costs, Computer programs, Mathematical models, Systems analysis.

The Hsintien Drainage Basin is located in northern Taiwan. The river is a major source of water supply and is carefully managed to maintain a desired water quality. Chance-constrained programming was used to derive a cost effective water quality control program. The water quality objective was to maintan a desired dissolved oxygen limit, and this was accomplished by determining the degree of treatment required at each wastewater source so as to minimize the total operating cost. The stochastic programming model accounted for the probabilistic nature of the streamflows in the river, providing an economic tradeoff between water quality and reliability. (Graf-Cornell)
W78-08309

EVALUATION AND IMPROVEMENT OF QUALITY CHARACTERISTICS OF URBAN STORMWATER,
New South Wales Univ., Kensington. (Austrialia). School of Civil Engineering.
I. Cordery.
Report No. 147, Water Research Laboratory, The University of New South Wales, Manly Vale, N.S.W., Australia, October 1976. 12 fig, 9 tab, 44 p, 28 ref.

Descriptors: *Stormwater, *Urban runoff, *Water pollution, *Evaluation, *Water quality control, Floods, Settling, Treatment, Sewage, Sewers, Effluents, Pollutants, Discharge(Water), Surface runoff, *Australia.

Stormwater samples collected from three urban catchments in Sydney, Australia show that in separately sewered areas the surface runoff has a greater concentration and carries a greater total load of pollutants than effluent from secondary sewage treatment plants. Pollution and nutrient indicators are highly concentrated in the 'first flush' at the start of urban storm runoff, but these concentrations fall rapidly to quite low levels during the passage of each flood. An important exception to this trend is phosphate. The phosphate concentration remains approximately constant during each flood. Whenever the discharge increases sharply the concentrations of suspended solids and phosphate increase slightly. However, the concentrations of BOD and ammonia do not usually increase after the first flush unless a later increase in discharge is extremely rapid. Faecal coliform concentrations in flood flows are usually between one and two orders of magnitude less than for raw sewage. Some of the stormwater samples were subjected to simple settling in the laboratory for durations of up to one hour. For a typical urban catchment, these laboratory tests show that on an annual basis, short duration settling of stormwater could remove amounts of pollutants comparable to the amounts which could be removed by tertiary treatment of secondary sewage effluent from the same catchment. The costs of settling storm runoff would probably be far less than tertiary treatment of secondary sewage effluent. (Graf-Cornell)
W78-08310

A REVIEW OF LOCAL AGENCIES IMPACTING REGIONAL WATER QUALITY MANAGEMENT.
Miami Valley Regional Planning Commission, Dayton, OH.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 375, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-208-MVRPC-M4, March, 1976. 113 p.

Descriptors: *Local governments, *Ohio, *Water resources, *Water quality control, Water quality, Waste treatment, Waste water treatment, Flood control, Water supply, Land use, Storm water, Solid wastes, Storm water runoff, Water management(Applied), Transportation, Planning, Federal Water Pollution Control Act.

The manner, scope and overall impact of twenty local governmental units' water quality management plans are reviewed in this report. The report will be used in the development and implementation of an areawide waste treatment management plan by the Miami Valley (Ohio) Regional Planning Commission. The plan will be designed to meet water quality goals of the Federal Water Pollution Control Act Amendments of 1972. Local governmental plans in the areas of wastewater management, water supply, land use, solid waste, storm water, flood control, transportation, and general water quality policies and programs are reviewed. The report revealed that the townships studied had minimal involvement in the functional areas of waste treatment, water supply, solid waste disposal and flood control. They were most involved in land use and storm water control. The larger municipalities and cities studied had programs based on statutes in basically all areas of local water quality management. County governmental plans were the most extensive, with programs in the areas of wastewater management, water supply and storm water management being broadcast in scope. However, county land use control measures were noticeably underdeveloped. (Easterbrook-Florida)
W78-08315

EVALUATION OF THE COLORADO WATER SUPPLY PROGRAM.
Environmental Protection Agency, Denver, CO. Water Supply Section.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 149, Price codes: A08 in paper copy, A01 in microfiche. November, 1974. 157 p.

Descriptors: *Colorado, *Water supply, *Water quality control, *Regulation, Water policy, Administrative agencies, State governments, Evaluation, Quality control, Surveys, Federal government, Public health, Permits, Law enforcement, Water quality standards, Legislation, Water supply development.

The study evaluated an estimated 704 community water supply programs serving 90% of Colorado's population and smaller public or individual systems serving recreational areas and the remainder of the population. The Colorado Department of Health requested the Environmental Protection Agency (EPA) to make the study to evaluate and determine the effectiveness of Colorado's water supply system. The EPA reviewed the records of the Colorado Department of Health for 394 community water supplies under surveillance in January of 1973 to form the basis of the survey. The bacteriological and chemical properties of the water were judged as well as the legislative and administrative regulation of the water supply program. Recommendations included increasing surveillance of public water supplies, improvement of fluoridation efforts, enforcement of regulations, legislating permit requirements for new systems, use of data processing equipment, and more governmental cooperation. Increases in funding, personnel, and office locations were also recommended to implement the goal of assuring each Colorado resident and visitor an adequate and safe supply of drinking water. (Molloy-Florida)
W78-08316

ACCOMPLISHMENT PLAN. REGION VIII. JORDAN RIVER BASIN--SALT LAKE CITY AREA.
Environmental Protection Agency, Denver, CO. Region VIII.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 265, Price codes: A03 in paper copy, A01 in microfiche. March, 1972. 44 p.

Descriptors: *Water quality control, *Utah, *River basins, *Comprehensive planning, Administrative agencies, Planning, Regional development, Waste water treatment, Pollutants, Coliform, Oxygenation, Water quality standards, Waste treatment, Waste disposal, Water pollution control, Oxygen demand, Recreation, Fishing, *Jordan River Basin(Utah).

The Environmental Protection Agency (EPA) prepared this plan for review by local government entities to promote a comprehensive, integrated effort in addressing the environmental problems of the Salt Lake City Area. The plan was also designed to inform the public about the EPA's role and efforts toward abatement of pollution. The area was selected as one of the highest priority areas for abatement and control. Significant pollution problems result from municipal and industrial sewage discharges, and natural air pollution. Broad objectives leading toward improvement of water quality include: improvement of Utah Lake to support perpetration of fish and recreational activities, maintenance of sufficiently low coliform concentrations to permit body contact recreation, and improvement of the Jordan River to support fish and recreation by reducing oxygen demand and coliform concentrations. The EPA seeks a 'C' classification for the Jordan River, protecting the water quality against controllable pollution. This classification would permit protection of aesthetics, propagation and perpetration of fish, recreation, and is required for state participation in higher percentage construction grant funding. (Molloy-Florida)
W78-08317

SUMMARY OF A WATER QUALITY SURVEY, GREELEY, COLORADO, NOVEMBER 16-19, 1971.
Environmental Protection Agency, Denver, CO. Technical Support Branch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 259, Price codes: A03 in paper copy, A01 in microfiche. Report SA/TSB-1, July 1971. 30 p.

Descriptors: *Rivers, *Colorado, *Effluents, *Waste water treatment, Surveys, Industrial plants, Sugar crops, Water quality control, Water quality, Waste facilities, Water pollution, Water pollution sources, River regulation, Waste assimilitive capacity, Water quality standards.

This survey was conducted on the Cache La Poudre River and on selected waste discharges in the Greeley area in November of 1971. The purpose of the survey was to assess the effect of Great Western's sugar factory on the river and to determine the characteristic of the waste discharged from this plant. The results indicated that the Greeley wastewater treatment facility was overloaded and that the sugar refinery was discharging high strength waste with minimal

treatment. Despite the adverse effects of both of these facilities on the river, existing waste quality standards were not violated. Bacterial contamination was found upstream of the two facilities. Recommendations included expansion or renovation of the wastewater treatment facility to reduce loading, provision of treatment facilities at the sugar refinery to produce an effluent suitable for discharge, and further investigation to determine the source of the upstream bacterial pollution. The study included the entire Greeley area because of the proximity of the waste facilities and other possible discharge sources.
W78-08318

EVALUATION OF EFFLUENT REGULATIONS OF THE STATE OF ILLINOIS.
Illinois Inst. for Environmental Quality, Chicago.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 101, Price codes: A04 in paper copy, A01 in microfiche. Report IIEQ 76/21, June 1976. 51 p.

Descriptors: *Illinois, *Water quality standards, *Effluents, *Regulation, Water pollution, State governments, Water quality control, Governmental interrelationships, Standards, Legislation, Planning, Federal Water Pollution Control Act, Administrative agencies, Permits, Monitoring, Control.

This report, prepared by the Illinois Effluent Standards Advisory Group (IESAG), presents the results of its evaluation of the effluent standards of Rules 406 and 408, Part IV, Chapter 3 of the Illinois Pollution Control Board Rules and Regulations, as applied to industrial discharges. The report contains the results of that evaluation, and IESAG recommendations pertaining to effluent standards. In its considerations, IESAG took into account the capabilities and economics of available pollution abatement technology, the standards of other states, as well as the effluent limitation guidelines issued by the EPA. The recommendations pertain to monitoring requirements, acceptable effluent variability, compatibility of federal and state criteria, procedures for permitted exceptions to the standards, and application of the ammonia-nitrogen and pH standards. IESAG found that some effluent standards should be retained at their present value and that other values should be modified. IESAG also recommended that certain parameters be added as contaminants to be regulated under rule 408, and that some pollutants be deleted from the regulated list. The report was prepared for the Illinois Institute for Environmental Quality. (Molloy-Florida)
W78-08319

MANPOWER PLANNING CRITERIA MANUAL FOR STATE WATER POLLUTION CONTROL AGENCIES.
Abt Associates, Inc., Cambridge, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 711, Price codes: A04 in paper copy, A01 in microfiche. 1973. 71 p.

Descriptors: *Planning, *Legislation, *State governments, *Monitoring, *Research and development, Manpower, Environment, Organizations, Data collections, Waste water, Personnel management, Water quality, Oil pollution, Forecasting, Administrative agencies, Water pollution control, Local governments.

The Manpower Development Staff, Office of Water Program Operations, Environmental Protection Agency (E.P.A.) is responsible for forecasting the number and types of personnel needed by various levels of governments, private industry, and other organizations which have a role in implementing environmental legislation. To assist in this determination process the EPA is presently working with and assisting state and local governments in establishing their own in-house manpower planning capabilities by developing a systematic approach to manpower planning. One aspect of this is the development of manpower planning criteria. The criteria presented in this report consist of selected program definitions, associated occupation descriptions, and staffing guides for estimating state water pollution control agency manpower and training requirements. The programs defined herein include monitoring and data support; research and surveillance of water quality; oil and hazardous substances; and municipal waste water systems. (Hammersley-Florida)
W78-08320

HOW THE DRINKING WATER ACT AFFECTS INDUSTRIAL PLANTS,
Allied Chemical Corp., Morristown, NJ. Specialty Chemical Div.
E. Shields.
Pollution Engineering, Vol 8, No 8, p 35, August, 1976.

Descriptors: *Turbidity, Water analysis, Analytical techniques, *Potable water, Coliforms, Nitrates, Bacteria, Membrane processes, Surface waters, Wastes, Chemical analysis, Sanitary engineering, Regulation, Monitoring, Construction, Water treatment, Administrative agencies.

The National Interim Primary Drinking Water Regulations which were promulgated in December, 1975 become effective on June twenty-fourth 1977. The regulations apply to those who own, operate on control a private portable water system that provides on treats its own water and has at least fifteen service connection or regularly serves at least twenty five individuals daily at least sixty days out of the year. The article lists nine important provisions of the regulations that apply to these 'noncommunity public water systems'. These regulations include: approval by the state or Environmental Protection Agency for new systems or increasing the capacity of existing systems; effective dates of monitoring and those factors to be monitored; reports that must be submitted; and records that must be kept. It is advisable for those affected to check their system's water for those contaminants which will require monitoring. Failure to prepare ahead of time may mean taking the conective measures under the regulatory agency pressure and publicity which form an important part of the regulations' enforcement provisions. (Beamer-Florida)
W78-08322

SUSPENDED SOLIDS LIMITATIONS FOR WASTEWATER TREATMENT PONDS.
Environmental Protection Agency, Washington, DC.
Federal Register, Vol 42, No 195, p 54664-54666, October 7, 1977.

Descriptors: *Administrative agencies, *Administrative decisions, *Ponds, *Suspended solids, *Waste water treatment, Algae, Biochemical oxygen demand, Decision-making, Design flow, Economic justification, Effluents, Environment, Environmental control, Environmental effects, Environmental sanitation, Federal government, Federal Water Pollution Control Act, Industrial wastes, Liquid wastes, Pollutants, Regulation, Waste water(Pollution), Waste water disposal, Water law.

The Environmental Protection Agency (EPA) amended the Secondary Treatment Information regulation to allow less stringent suspended solids limitations for wastewater treatment ponds. Promulgation of the amendment is based on the fact that properly operated treatment ponds are a form of secondary treatment which may be incapable of meeting the limitations contained in the regulation without supplemental treatment processes for removal of such suspended solids as algae. In light of comments received prior to the adoption of the amendment, the EPA changed the proposed rule to allow for adjustment of suspended solids limitations for wastewater treatment ponds with a maximum facility design capacity of two million gallons per day or less. The EPA concluded, in answer to objections received, that the amendment was justified for historical, technical, and economic reasons, and that it would ultimately prove beneficial, particularly to smaller communities. Other problems discussed by the EPA involved the rule's applicability to private and federally-owned sewage treatment plants; its relationship to industrial effluent limitations; biochemical oxygen demand limitations for ponds; use of suspended solids as a regulatory parameter for wastewater treatment ponds; and, availability of suspended solids monitoring data. (White-Florida)
W78-08325

NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM, GENERAL PERMIT PROGRAM (PROPOSED RULES).
Environmental Protection Agency, Washington, DC.
Federal Register, Vol 42, No 24, p 6846-47, February 4, 1977.

Descriptors: *Water pollution control, *Federal Water Pollution Control Act, *Administrative agencies, *Agricultural runoff, *Storm runoff, Sewers, Surface runoff, Water pollution, Water pollution sources, Storm water, Water permits, Water quality, Pollutants, Irrigation, Navigable water, Animal populations, Permits, Agriculture, Storm drains, Federal government.

Pursuant to a court order, the Environmental Protection Agency establishes additional regulations for the issuance of National Pollutant Discharge Elimination System (NPDES) permits. These regulations extend the permit system to include all point sources in the concentrated animal feeding operation, separated storm sewer, agricultural, and silvicultural categories. The program will be implemented in two phases: (1) permit-issuing agencies are required to designate general permit programs areas (GPPAs) that correspond to existing institutional and geographical boundaries, and (2) within one year after the GPPAs are designated, general permits will be issued in each GPPA to cover owners and operators of point sources. An owner or operator may exclude himself from the general permit process. However, any such excluded owners or operators would then be subject to the conventional NPDES permit program. The general permits will be issued in each GPPA to cover owners and operators not receiving individual permits in the separate storm sewer and agriculture categories. General permits may be issued for a maximum five year period and may be terminated in instances where an approved plan is not followed or a point source is found to be a significant pollution source. (Quarles-Florida)
W78-08326

AN ENVIRONMENTAL OVERVIEW OF GEOTHERMAL RESOURCES DEVELOPMENT,
Indiana Univ. at Bloomington. School of Law.
A. D. Tarlock, and R. L. Waller.
Land and Water Law Review, Vol. 13, No. 1, p 289-324, 1977.

Descriptors: *Water pollution control, *Brine disposal, *Geothermal studies, *Energy, *Thermal pollution, Seismic properties, Surface waters, Groundwater, Seepage, Aquifer management, Craters, Geysers, Environmental effects, Permits, Federal Water Pollution Control Act, Water cooling, Thermal power, Resources development, Effluents, Water pollution.

This article discusses both the advantages and disadvantages of the development and use of geothermal resources as a potential future energy source. One of four areas of potential adverse environ-

mental impact discussed is water pollution. Blow outs, cratering and mud ejection could cause local property damage and pollution of surface and groundwaters could occur because of brine disposal, seepage or spillage. Additional water pollution problems encountered during power generation may arise in connection with the disposal of cooling waters and other wastes from liquid-dominated systems. The reinjection of saline brine into an area's water reservoir presents the serious problem of potential aquifer pollution, a potential subsidence problem, as well as the remote possibility that the reinjection will trigger seismic activity in the area. Adequate liability assessment provisions appear to currently exist under various state and federal water pollution control laws, particularly the Federal Water Pollution Control Act Amendments of 1972. Pollutant discharge would also be subject to permitting under the National Pollution Elimination Discharge System. Both point source effluent limits and thermal pollution effluent standards would control the Environmental Protection Agency or appropriate state agency permitting procedure. (Easterbrook-Florida)
W78-08327

RECENT DEVELOPMENTS IN THE REGULATION OF OCS OIL AND GAS ACTIVITY,
Liskow and Lewis, New Orleans, LA.
J. B. St. John, Jr.
In: Proceedings of the Twenty-eighth Annual Institute on Oil and Gas Law and Taxation, Southwestern Legal Foundation, February 9-11, 1977, Dallas, Texas, Matthew Bender, New York, New York, 1977. p 217-44.

Descriptors: *Coasts, *Coastal structures, *Continental shelf, *Oil, Shore protection, Federal jurisdiction, Legislation, Mining, Offshore platforms, Drilling, Fuels, Oil industry, Gases, Exploration, Drilling equipment, Natural resources, Water law, Legal aspects.

Because the United States' production of oil and gas in the 1970s was lagging far behind consumption, the federal government undertook a program to develop the outer continental shelf through offshore lease sales. A number of coastal states concerned with the offshore impacts of offshore oil and gas exploration and development have challenged these sales in the courts. Congress attempted to meet the complaints of the coastal states by passing the Coastal Zone Management Act of 1972, and by amending it in 1976. The amendments create a comprehensive frame work in which coastal states can work with the federal government to provide a national basis for the siting of coastal energy facilities, the development of these sites, and for exploratory drilling operations. Proposed amendments to the Outer Continental Shelf Lands Act of 1953, if passed, would also provide for more environmental protection, allow the states to participate more directly in the decision making process, and subject Outer Continental Shelf oil and gas leasing to public scrutiny. Predictably these amendments will substantially slow the pace of outer continental shelf development. (Curtis-Florida)
W78-08328

THE ROAD TO EROSION--A CAUTIONARY TALE,
California Univ., Berkeley. Dept. of Conservation and Resource Studies.
For primary bibliographic entry see Field 4D.
W78-08332

THE INDIANA EXPERIMENT,
T. Wyman.
Environment, Vol. 19, No. 5, p 2-4 (June-July, 1977).

Descriptors: *Indiana, *Phosphats, *Phosphorus, *Algae, *Water pollution, Legislation, Detergents, Lakes, Soaps, Sewage, Environmental effects, Limnology, Surface waters, Nutrients, Water quality, New York, Sewage effluents, Agricultural runoff, Water quality control.

A second attempt to repeal Indiana's phosphate-detergent ban has failed, but opposition to the ban continues to be strong. The 1972 ban was intended to reduce the amount of phosphorus reaching lakes and rivers in sewage flow and thereby retard excessive growth of algae. Controversy over the effectiveness of such a ban continues to rage. The most powerful opponent to the ban continues to be the Soap and Detergent Association. Studies have indicated that since the ban, algae pollution has dropped, but studies remian inconclusive as to the cause of reduction. Legislation regulating phosphates has been extemely slow, with New York being the only other state wtih a phosphate law in effect. The article traces the beginnings of the Indiana ban up to the current attempts to repeal it. Statistical proof of the ban's effectiveness is difficult to document. Opponents of the ban claim that non-phosphorus detergents are ineffective and more costly. The author calls for survey programs to resolve the questions remaning as to the effects of phosphate bans. (Quarles-Florida)
W78-08335

ZERO DISCHARGE INTO WATERS BY 1985, NO WAY,
M. Zeldin.
Audubon, Vol. 77, No. 4, p 97-100, July, 1975.

Descriptors: *Federal Water Pollution Control Act, *Pollution abatement, *Water pollution control, *Administrative agencies, *Federal government, Discharge(Water), Waste water(Pollution), Regulation, State governments, Permits, Administration, Supervisory control(Power), Legislation, Water quality control, Waste Disposal, Water law.

The Federal Water Pollution Control Act goals of water clean enough to swim in by July 1, 1983, and no discharge of pollutants into the nation's waters by 1985, will not be attained because requirements of the act have not been enforced by the Environmental Protection Agency (EPA) due to understaffing and ineptness. States and industries are unhappy with the law; criticism includes poor EPA implementation, setting nationwide rather than plant-by-plant effluent limitations, and the impractically of the zero discharge goal. Also criticized is the lack of funds promised by Congress ro help communities build sewage treatment facilities, to help state and local water pollution control agencies, and to staff EPA. The author suggests that the reason for some of criticism is that states and industries find it hard to accept the authority the 1972 act conferred upon the EPA. Previously, the federal government had little authority in water pollution control, whereas the act established a national regulatory program with abatement requirements, strengthened enforcement procedures, and provided heavy penalties for violators. The ultimate success of the act seems to depend upon Congressional appropriations and amendments. (Rule-FLorida)
W78-08336

AN OFFER TOO GOOD TO REFUSE,
Department of the Interior, Washington, DC.
For primary bibliographic entry see Field 6E.
W78-08348

THE FEDERAL RECLAMATION PROGRAM.
Reclamation Era, Vol 59, No 3, p 14-18, Summer 1973.

Descriptors: *Reclamation, *Impaired water use, *Water reuse, *Irrigation programs, *Reclaimed water, Land reclamation, Federal Reclamation Law, Recirculated water, Waste water(Pollution), Water treatment, Flood control, Recreation, Hydroelectric power, Irrigation practice, Irrigated land, Water distribution(Applied), Governments, Reservoirs, Planning, Water sources.

Since its development in 1902 the Federal Reclamation Program has guided construction of reservoirs, dams and hydroelectric power plants. Originally designed to help settle western states by providing irrigation water, the program is intended to recover 90% of capital costs, and uses an extensive cost-benefit economic analysis for each proposed project. Since its conception, program emphasis has shifted from agricultural projects to multipurpose projects. Today, the basic types of output from reclamation projects include municipal and industrial water, hydroelectric power, recreational facilities (including fish and wildlife), agricultural water, and flood control. Crop and livestock production have increased due to a water supply assured by reclamation. In addition, the low cost hydroelectric power reclamation provides has facilitated industrial development in the Northwest. Reclamation projects also provide recreational opportunities such as camping, as well as supplying increasing amounts of water for urban and industrial use. Future concerns require adapting the program to changing national objectives and needs, including analyses of environmental impacts while recognizing the continuing need for federal involvement in water resource development. (Mulligan-Florida)
W78-08350

IMPORTANCE OF ANALYSES FOR YOUR NPDES PERMIT,
Abbott Labs., North Chicago, IL. Corporate Environmental Services.
M. R. Stumph.
Pollution Engineering, Vol 7, No 6, p 42-44, June, 1975.

Descriptors: *Waste water(Pollution), *Effluents, *Assay, *Water analysis, *Analytical techniques, Industrial wastes, Wastes, Water pollution, Chemical analysis, Colorimetry, Biochemical oxygen demand, Acidity spectroscopy, Management, Permits, Data collections, Sampling, Reliability, Water treatment, Waste water.

To meet the requirements of the National Pollution Discharge Elimination System permit program, industrial and municipal water permit holders must regularly sample, analyze and report effluent quality. For valid interpretation, the sample to be analyzed must be representative, uncontaminated, and of adequate size. In addition the sample must be properly and completely indentified. Preservation methods should be utilized if there is a time lapse between collection and analyze. Proper containers and stoppers must also be employed. To insure validity, the Environmental Protection Agency will send, without charge, samples to work as independent check. Other means of rececking accuracy include both internal rechecking and the use of outside laboratories. A program to insure the reliability of the data is essential because of the importance of laboratory analyze and the resultant actions which it produces. Financial decisions on process changes, plant modifications or even the construction of a new facility may be based on results of the laboratory analyze. Industry must also realize that the procedures used and the reported values may be challenged in court. This article recommends that an established routine control program be applied to every analytical test to insure the reliability of the final results. (Beamer-Florida)
W78-08352

WATER POLLUTION REMEDIES--USE OF PUBLIC NUISANCE THEORY IN SUIT BY FEDERAL AND STATE GOVERNMENTS,
P. E. Murray, Jr.
Boston College Industrial and Commercial Law Review, Vol 15, No 4, p 795-813 (April 1974). 97 ref.

Descriptors: *Judicial decisions, *Lake Michigan, *Water pollution control, *Common law, *Rivers and Harbors Act, Navigable waters, Legal

aspects, Law enforcement, Water law, Federal jurisdiction, State jurisdiction, Public rights, Governmental interrelations, Federal government, Illinois, Water quality, Industrial wastes, Interstate rivers, State governments, *Standing(Legal), *Interstate bodies of water, *Federal Water Pollution Control Act(FWPCA) Amendments of 1972, *Nuisance(Legal aspects), Injunctive relief.

This case note examines the decision in United States v. United States Steel Corporation, and its impact on future water pollution litigation. The United States and the State of Illinois sought an injunction to prevent defendant from discharging its industrial waste into Lake Michigan on the basis of three theories: federal common law power to abate public nuisances in navigable or interstate waters; violation of the Rivers and Harbors Act of 1899; Illinois common law power to abate public nuisances. The court found that both the U.S. and Illinois had a cause of action and standing to sue in federal court under the federal common law of nuisance to abate pollution of navigable interstate waters. Plaintiffs' third theory was dismissed as merely cumulative, but the court also upheld the United States' right to sue under the 1899 Act. No prior case had acknowledged a valid federal common law action to enjoin pollution by a private as opposed to governmental corporation. Diversity was not needed for a state to invoke federal jurisdiction since actions based on federal common law nuisance are federal questions; standing of the U.S. arose from the necessity for uniform decisions and a proprietary interest in navigable waters. Allowance of federal invocation of federal common law is, however, inconsistent with the clear legislative intent to encourage states to bear the primary responsibility for pollution abatement. (Moorhouse-Florida)
W78-08353

THE POTENTIAL EFFECTS OF CLEARING AND SNAGGING ON STREAM ECOSYSTEMS,
Kansas State Univ., Manhattan. Div. of Biology.
For primary bibliographic entry see Field 5C.
W78-08358

MANAGEMENT OF BOTTOM SEDIMENTS CONTAINING TOXIC SUBSTANCES: PROCEEDINGS OF THE SECOND U.S.-JAPAN EXPERTS' MEETING--OCTOBER 1976, TOKYO, JAPAN.
Corvallis Environmental Research Lab., OR.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 684, Price codes: A14 in paper copy, A01 in microfiche. Report EPA-600/3-77-083, July 1977. 294 p, 2 append. 1BA608.

Descriptors: *Dredging, *Bottom sediments, *Spoils, *Waste disposal, *Waste treatment, *Water pollution control, *Ultimate disposal, *Eutrophication, Japan, Pollutants, Toxins, Mercury, Polychlorinated biphenyls, Heavy metals, Nutrients, Sediments, Land reclamation, Soil stabilization, Industrial wastes, Bioaccumulation, Sludge disposal, Minamata Bay(Japan).

The Second U.S.-Japan Experts' Meeting on the Management of Bottom Sediments Containing Toxic Substances was held in October 1976 in Tokyo, Japan. Ten Japanese papers focus on dredging of contaminated bottom sediments in Japanese waterways for water pollution control, and subsequent spoils treatment and disposal problems. Papers deal with an overview of the dredging program in Japan, pollution control measures in Tokyo Bay, dredging and sludge disposal in the Seto Inland Sea, the methylmercury accumulation mechanism in the red sea bream, determining trace methylmercury in seawater, evaluation of possible secondary pollution from heavy metals and PCBs during spoils disposal, behavior of mercury compounds in Minamata Bay sediments, a mechanical method of stabilizing spoils in a landfill for covering with sand, evaluation of chemical soil-stabilization agents, and disposal of spoils effluent without use of flocculants and with reduced turbidity. Six United States papers include a survey of sources of toxic sediments dumped into the oceans and EPA control measures, use of hydraulic dredging for lake restoration, effects of dumping dredging spoils into Puget sound, spoils disposal effects in San Francisco Bay, dewatering and treatment of dredging spoils, and benthic macrofauna as indicators of the effects of spoils disposal. (Lynch-Wisconsin)
W78-08359

REDUCING WATER QUALITY DEGRADATION THROUGH MINIMIZED LEACHING MANAGEMENT,
Agricultural Research Service, Riverside, CA. Salinity Lab.
J. D. Rhoades, and D. L. Suarez.
Agricultural Water Management, Vol 1, No 2, p 127-142, September, 1977, U.S. Salinity Laboratory Publication 621. 10 tab, 15 ref.

Descriptors: *Water quality control, Water conservation, Water management(Applied), Water resources development, Saline water, Impaired water quality, *Leaching, Irrigation practices, Water pollution sources, Soil-water-plant relationships, Surface-groundwater relationships, Crop production.

The United States endorses a policy of improving water quality and conserving natural resources through minimized leaching programs to reduce salinity pollution for irrigated agriculture. Report summarizes significant leaching conditions by which minimized leaching can improve water quality. Report indicates reduced leaching was beneficial under the following conditions: (1) desalination processes are practical and drainage waters are not returned to receiving waters; (2) saline groundwater concentrations in excess of those recharging drainage waters are displaced by the surface water, (3) waters with low salinity content, are used to irrigate soils containing gypsum or gypsum substrata; and (4) groundwater is under-saturated with $CaCO_3$ (unlikely with arid lands). Report concludes by stating that effective leaching is limited by individual crop tolerance to increased salinity in the lower root zone. (Jewkes-Arizona)
W78-08366

USING SAND FILL TO COVER DREDGE SPOILS CONTAINING MERCURY,
Kitakyushu Municipal Port and Harbor Bureau, Fukuoka (Japan).
S. Fujino.
In: Management of Bottom Sediments Containing Toxic Substances; Proceedings of the Second U.S.-Japan Experts' Meeting--October 1976, Tokyo, Japan. Report No. EPA-600/3-77-083, July 1977, p 144-154. 9 fig, 2 tab, 2 ref. 1BA608.

Descriptors: *Mercury, *Dredging, *Spoils, *Landfills, *Waste disposal, *Dokai Bay(Japan), *Ultimate disposal, Sands, Japan, Kitakyushu(Japan), Mud, Bottom sediments, Sediments, Bays, Pollutants, Water pollution control, Soil stabilization, Methodology.

Highly contaminated dredge spoils from Dokai Bay, Kitakyushu, Japan, was safely disposed of by means of impoundment in a diked basin overlain with bamboo and plastic mesh and covered with sand, Subsequent sampling of the sand layer and adjacent groundwater showed no secondary pollution. The 350,000 cu m of bottom sediments dredged from the bay contained an average of 50 mg/kg mercury, and considerable amounts of lead, chrome, cyanide, and arsenic. The spoil area, covering 52,600 sq m, was prepared by enclosing a basin of the bay with a double sheet-piled wall which was lined with plastic sheets to prevent polluted water from seeping out. The spoil formed a very soft soil seven m thick and 2.5 m above the datum level. To eliminate offensive odors and prevent dried surface soil from being carried away by the wind, a layer of sand was used. Due to softness of the spoil and danger of eruption an undercovering was needed to stabilize the muddy sediment. Four methods were rejected as ineffective or too expensive. The method selected consisted of laying a raft of bamboo poles 70 cm apart arranged at right angles over the spoil, placing polypropylene ropes between the poles, and covering the raft with sheets of polypropylene cloth. Clean sea sand was spread over this network to a depth of 1.3 m. (See also W78-08359) (Lynch-Wisconsin)
W78-08367

DREDGED MATERIAL DENSIFICATION AND TREATMENT OF CONTAMINATED DREDGED MATERIAL,
Army Engineers Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5E.
W78-08374

COMPARISON OF THE PHOTOSYNTHETIC CHARACTERISTICS OF THREE SUBMERSED AQUATIC PLANTS,
Florida Univ., Gainesville. Dept. of Agronomy.
For primary bibliographic entry see Field 5C.
W78-08376

MINNESOTA WATER QUALITY: A REPORT TO THE CONGRESS OF THE UNITED STATES BY THE STATE OF MINNESOTA PURSUANT TO SECTION 305(B) OF THE FEDERAL WATER POLLUTION CONTROL ACT,
Minnesota Pollution Control Agency, Roseville.
J. C. Winslow, D. J. Trippler, L. R. Peissig, J. G. Schilling, and J. Nutter.
June 1977. 45 p, 4 fig, 5 tab.

Descriptors: *Minnesota, *Water quality, *Water pollution control, *Rivers, *Lake Superior, Economics, Nonpoint pollution, Lake restoration, Eutrophication, Mississippi River, Asbestos, Ammonia, Biochemical oxygen demand, River basins, Coliforms, Turbidity, Pollutants, Water quality standards, Fishing, Swimming, Dissolved oxygen.

The water quality of 26 Minnesota rivers, grouped into 11 basins, plus Lake Superior, were assessed for the water year 1976 using chemical and physical data from 75 state monitoring stations. Comparison of existing water quality with the national 1983 goal of 'fishable' and 'swimmable' water indicates most rivers currently conform with the goal, equated with class 2B of Minnesota water quality standards. However, 23% of the monitoring stations fail to meet one or both of the two aspects of the goal, including the Mississippi River below Minneapolis-St. Paul, the Zumbro River below Rochester, the Cedar River below Austin, Buffalo Creek below Glencoe, Center Creek below Fairmont, and the headwater tributaries of the Missouri and Des Moines Rivers. It is estimated that, due to inadequate funding, by 1983 11% of the waterways assessed will still not be in compliance. Of these, the headwater tributaries of the Missouri and Des Moines rivers have acute nonpoint source pollution problems due to agriculture and natural conditions, and the metropolitan segment of the Mississippi River is contaminated by combined sewer overflows, urban runoff, and pathogens from municipal treatment plants. An investment of $320 million would reduce agricultural nonpoint pollution about 45%. Costs of lakeshore erosion control are estimated at $400 million. (Lynch-Wisconsin)
W78-08387

THE COST OF WATER SUPPLY AND WATER UTILITY MANAGEMENT (VOLUMES I AND II),
Municipal Environmental Research Lab., Cincinnati, OH. Water Supply Research Div.
R. M. Clark, and J. I. Gillean.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 639, Price codes: A09 in paper copy, A14 in microfiche; and PB-276 640, Price codes: A01 in paper copy, A01 in microfiche. Reports EPA-600/5-77-015a and b, November 1977. 170 fig, 192 tab, 1 append. 1CC614, SOS 1. 68-03-2071.

Descriptors: *Water management(Applied), *Water supply, *Utilities, *Safe Drinking Water Act, *Potable water, *Mathematical models, Cincinnati(OH), Kansas City(MO), Fairfax County(VA), Dallas(TX), Elizabeth(NJ), San Diego(CA), New Haven(CN), Phoenix(AZ), Kenton County(KY), Orlando(FL), Pueblo(CO), Seattle(WA), Model studies, Economics, Decision-making, Cost analysis, Water purification, Forecasting.

Ten years of system and cost data for 12 water utilities selected to represent each of the ten EPA regions indicate an increasing demand for revenue-producing water, increasing labor wage rates, and increases in other operating and capital costs associated with water supply. However, the man hours required to supply one million gallons of water has decreased, and if unit costs are adjusted to the Consumer Price Index, costs have actually declined. The study (1974-76) was carried out in response to provisions of the Safe Drinking Water Act of 1974. The utilities studied were those of Cincinnati, OH; Kansas City, MO; Dallas, TX; Fairfax County, VA; Elizabeth, NJ; San Diego, CA; New Haven, CN; Phoenix, AZ; Kenton County, KY; Orlando, FL; Pueblo, CO; and Seattle, WA. Volume I provides summary information and a detailed aggregate analysis of the first five utilities listed; factors affecting the cost of water supply are examined, and the impact of the Safe Drinking Water Act is projected to 1980. Volume II contains basic data for each of the 12 utilities. Services of each utility are listed in five functional areas: (1) support services, (2) acquisition, (3) treatment or purification, (4) distribution, and (5) power and purification. Costs are categorized as operating or capital. Mathematical models relate labor cost, productivity, and production to annual operating costs. (Lynch-Wisconsin)
W78-08390

A DECADE OF NONDEGRADATION POLICY IN CONGRESS AND THE COURTS: THE ERRATIC PURSUIT OF CLEAR AIR AND CLEAN WATER,
Iowa Univ., Iowa City. Coll. of Law.
N. W. Hines.
Iowa Law Review, Vol 62, No 3, p 643-701, February 1977.

Descriptors: *Nondegradation policy, *Judicial decisions, *Legislation, *Legal aspects, *Water pollution control, *Air pollution, Industrial wastes, Watersheds(Basins), Economics, Cost-benefit analysis, Governments, Environmental Protection Agency, Sierra Club v Ruckelhaus, Sierra Club v EPA, History, Political aspects, Social values, Environmental effects, Water pollution effects, Commonwealth Edison v EPA.

A comprehensive discussion of the federal commitment since 1965 to a policy of nondegradation of air and water in the U.S. concludes that it is a fundamental concept which must be embraced and implemented in a national pollution control program. The policy, difficult to accomplish politically in a federal system, requires that no significant deterioration be allowed in existing high quality air and water unless necessary to meet compelling social or economic needs. Congressional failure to expressly enact the policy and the absence of an explicit legal basis have impaired the policy's effectiveness, and immediate congressional intervention is essential. Theoretical, political, and economic aspects of the policy are reviewed, including a discussion of benefit-cost analysis. The paper traces the history of water and air pollution legislation in the U.S., including the Water Quality Act of 1965, the Federal Clean Air Act (amended as the Air Quality Act of 1967), the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500), and proposed 1976 air quality regulations. Three major judicial decisions are analyzed, Sierra Club v. Ruckelshaus (1972) and Sierra Club v. EPA (1976), which concerned EPA's interpretation of air and water pollution policy, and Commonwealth Edison v. EPA, which challenged the agency's power to adopt water quality regulations. Congressional review of nondegradation and state actions are discussed. (Lynch-Wisconsin)
W78-08393

AN EXAMINATION OF PROBLEMS AND POTENTIALS FOR FUTURE LARGE-SCALE INTENSIVE SEAWEED CULTURE SYSTEMS,
Massachusetts Univ., Wareham. Aquacultural Engineering Lab.
For primary bibliographic entry see Field 6C.
W78-08396

CONCLUSIONS DRAWN FROM THE REVIEW OF ENVIRONMENTAL POLICIES OF JAPAN.
Organization for Economic Co-operation and Development, Paris (France).
Publication No 38062, August 1977. 6 p.

Descriptors: *Japan, *Environmental control, *Pollution abatement, *Air pollution, *Governments, Organization for Economic Cooperation and Development, Economic development, Standards, Compensation, Economics, Pollutants, Pollution taxes(Charges), Water pollution control, Public health, Monitoring, Policies.

A review of Japan's environmental policies by the Environment Committee of the Organization for Economic Cooperation and Development (OECD), conducted in July 1977, concludes that, while forceful measures have been taken in that country without complete scientific data and often with little information on economic costs and consequences, benefits have outweighed adverse effects. Japanese policy gives highest priority to pollution control, especially air pollution and control of such toxicants as mercury, cadmium, and PCBs. Water pollution receives less attention. Environmental policy has focused on health objectives rather than on the broader area of quality of life. Business has responded to the stringent standards with acceptance and development of strikingly successful new technology measures to meet them. In most cases Japanese policy has conformed to OECD decisions and recommendations. Local governments have played a crucial role in setting emission standards. Sophisticated and costly monitoring networks have been developed in all major areas. The compensation system, both judicial and administrative, has been rigid, but has met immediate, urgent needs. The main deterrent to pollution remains, however, emission standards. Macroeconomic consequences of the rigorous policies do not appear serious. An important policy allows individual plants to allocate permissible emission levels among individual sections within the facility, resulting in increased efficiency. (Lynch-Wisconsin)
W78-08397

PUTTING WETLANDS TO WORK (CYPRESS DOMES AND PEATLANDS OFFER ECOLOGICALLY SOUND, ENERGY-CONSERVING WASTEWATER DISPOSAL).
National Science Foundation, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 453, Price codes: A02 in paper copy, A01 in microfiche. MOSAIC, Vol 8, No 3, p 25-29, May-June, 1977. 3 fig. Also as Report NSF/RA-770224.

Descriptors: *Wetlands, *Waste assimilative capacity, Wastewater, *Waste disposal, *Sewage effluents, Wastes, Sewage, Water pollution, Water treatment, Sewage treatment, Nutrients, Water quality, Water supply, Florida, Michigan, *Duckweed, *Peatlands, *Cypress Domes.

Two research projects, conducted in Florida and in Michigan, designed to ascertain the capability of wetlands to absorb partially treated wastewater from municipal facilities are reported. These studies suggest that wetlands are ecological systems that not only can absorb treated effluents while treating them in a natural rather than energy-consuming, artificial way, but can benefit from the fertilization secondarily treated effluents are able to provide. The research suggests that as long as the effort is based on understanding of the wetlands environments, it represents a way that civilized man can return to a symbiotic relationship with an important part of his natural environment. There is substantial opportunity for small communities to take advantage of the results of these experiments. (Maroncelli-Mass)
W78-08406

GROWTH OF WATER HYACINTHS IN TREATED SEWAGE EFFLUENT,
Iowa State Univ., Ames. Dept. of Botany and Plant Pathology.
J. W. Wooten, and J. D. Dodd.
Economic Botany, Vol. 30, No. 1, p 29-27, January-March, 1976. 3 tab, 23 ref.

Descriptors: *Water hyacinths, *Nutrient removal, *Primary productivity, *Waste water treatment, Phosphorus, Nitrogen, Biological treatment, Sewage treatment, Value.

Two thousand of water hyacinth, Eichornia crassipes Solms., were introduced on 11 April 1971 into a series of five ponds, each 5000 sq. ft. in area and 2.6 ft. deep. Treated wastewater effluent from the Ames, Iowa, sewage treatment plant filled the ponds and was added to pond 1 at a rate of 127 gallons/minute. These plants increased to more than 500,000 in number, and all five ponds were covered completely by 26 July. On that date the extrapolated estimate of total weight was 287 U.S. tons/acre (645 metric tons/hectare). The estimated oven dry weight was 13.2 U.S. tons/acre (29.7 metric tons/hectare). Ammonia and nitrate disappeared rapidly from the pond water, and phosphate concentrations were lowered appreciably. Evapotranspiration and seepage accounted for water losses of more than 0.5 in/day. The potential economics values of this plant and its possible use in tertiary treatment to reduce N and P components of wastewaters are discussed briefly. (Stihler-Mass)
W78-08410

ORGANOCHLORINE PESTICIDE AND POLYCHLORINATED BIPHENYL RESIDUES IN SELECTED FAUNA FROM A NEW JERSEY SALT MARSH---1967 VS. 1973,
Iowa Cooperative Wildlife Research Unit, Ames.
E. E. Klaas, and A. A. Belisle.
Pesticides Monitoring Journal, Vol. 10, No. 4, p 149-158, March, 1977. 1 fig, 8 tab, 27 ref.

Descriptors: *Salt marshes, *Pesticides, *Pesticide residues, *Bioindicators, *DDT, Dieldrin, Hazards, Public health, Rails, Aquatic animals, Mollusks, Fish, Estuaries, Coastal marshes, Wetlands, New Jersey, *Polychlorinated biphenyls.

More than a half million pounds of DDT were applied to control mosquitoes in salt marsh estuaries of Cape May County from 1946 to 1966. The use of DDT was discontinued in the county after 1966.

Clapper rails, fish, and invertebrates were collected from six locations in 1967. Sampling was repeated at the same localities in 1973. Residue levels of organochlorine pesticides and polychlorinated biphenyls (PCB's) detected in these samples are reported and findings of 1967 and 1973 are compared. In 1967, mean concentrations of DDT and metabolites ranged from 0.63 to 9.05 ppm in aquatic fauna, but by 1973 mean residue levels had decreased 84 to 99 percent among nine species. DDE was still present at reduced levels in nearly all samples in 1973, but other DDT isomers had mostly disappeared. Dieldrin was detected only in clapper rails, and residue levels decreased during the period. Mean concentrations of PCB's increased in the clapper rail, remained the same in the fiddler crab and mud snail, and decreased in the sheepshead minnow, mummichog, striped killifish, and salt marsh snail. Small amounts of mirex, toxaphene, cis-chlordane (and/or trans-nonachlor), oxychlordane, and HCB were detected in a few specimens. (Maroncelli-Mass)
W78-08411

STREAM CHANNELIZATION IMPACTS ON SONGBIRDS AND SMALL MAMMALS IN VERMONT,
Massachusetts Univ., Amherst. Ddpt. of Forestry and Wildlife Management.
E. E. Possardt, and W. E. Dodge.
Wildlife Society Bulletin, Vol. 6, No. 1, p 18-24, Spring, 1978. 3 fig, 2 tab, 13 ref.

Descriptors: *Channeling, Effects, *Song birds, Wetlands, *Vermont, Dredging, Birds, Mammals, Wildlife, *Small mammals, *White River(Vermont), Warblers, Species diversity, Streamside vegetation, *Channelization, Channel improvement.

Stream channelization effects were documented in the White River watershed during the first and second years after channelization. Birds were mist-netted during four sampling periods. Percentages of birds collected from channelized areas were 33%, 27%, 38%, and 46% for fall 1974, spring 1975, early summer 1975 and later summer 1975, respectively. Species diversity was significantly less in channelized areas for fall 1974 and early summer 1975; highly significantly less for spring 1975; no significant difference existed for later summer 1975. Swallows and spotted sandpipers (Actitis macularia) were more abundant in channelized areas; thrushes, vireos, and particularly warblers were more abundant in non-channelized areas. Small mammals were live-trapped during three sampling periods. Percentages of mammals collected from channelized areas were 28%, 39% and 39% for fall 1974, early summer 1975, and later summer 1975, respectively. Shrews and jumping mice were most adversely affected; the white-footed mouse (Peromyscus leucopus), the most abundant small mammal collected, recovered rapidly in channelized areas. Impact on small mammals and songbird populations was most dramatic where streamside vegetation had been extensively destroyed. (Stihler-Mass)
W78-08412

ESTIMATED VALUES FOR SELECTED WATER HYACINTH BYPRODUCTS,
Georgia Univ., Athens. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6C.
W78-08415

PURIFICATION OF WASTE WATERS FOR SUBSOIL IRRIGATION (OCHISTKA STOCHNYKH VOD PRI PODPOCHVENNOM OROCHENII),
For primary bibliographic entry see Field 5E.
W78-08432

CLEVELAND PUSHES TO MEET STRICT EFFLUENT LIMITATIONS,
Cleveland Regional Sewer District, OH.
A. T. Ungar, and D. Patrick.
Water and Wastes Engineering, Vol. 15, No. 2, p 57-60, February, 1978.

Descriptors: *Treatment facilities, *Sludge treatment, *Sludge disposal, *Transfer, *Sludge digestion, Chemical precipitation, Vacuum drying, Dewatering, Lime, Polymers, Centrifugation, Incineration, Waste water treatment, Municipal wastes.

Four sewage treatment facilities, with a combined capacity of 251.6 mgd, treat the municipal wastes, storm water, and sludge in the Cleveland, Ohio, area. The largest treatment plant, based on the activated sludge method, receives wastes which average 125 mg/liter BOD and 135 mg/liter suspended solids. Sludge produced by the plant is pumped 13.2 miles through a 12-inch cast iron force main to the next largest treatment facility for final treatment at a rate of 1,200-1,400 gpm. Sludges from both plants currently undergo primary settlement, anaerobic digestion, and vacuum filtration. The incinerators, which normally dispose of the sludge, are being modified to incinerate up to 400 tons sludge/day. Further treatment in addition to current practices includes cyclone degritting, gravity thickening, centrifugation, and sludge conditioning with ferric chloride ans lime or polymers. The 35 mgd treatment plant employs 64 Imhoff primary treatment tanks, primary digestion, and vacuum filtration. A physical-chemical treatment plant with a 50 mgd dry weather flow ans a 100 mgd wet weather capacity, is planned. The smallest 1.6 mgd treatment plant will be operated until interceptor lines are constructed to transport wastes from the area to the second largest facility. (Lisk-FIRL)
W78-08440

ABATEMENT OF ODOR IN SEWAGE WORKS--DETERMINED IN HEIDELBERG (GERUCHSBEKAEMPFUNG IN KOMPOSTWERKEN AM BEISPIEL HEIDELBERG),
Technische Univ., Berlin (West Germany). Fachgebiet Abfallwirtschaft.
For primary bibliographic entry see Field 5D.
W78-08451

RIVER WATER QUALITY IN ESSEX DURING AND AFTER THE 1976 DROUGHT,
Essex Water Co., (England).
For primary bibliographic entry see Field 5B.
W78-08491

SPRAY IRRIGATION OF DOMESTIC SEWAGE IN THE BRAUNSCHWEIG SEWAGE ASSOCIATION - ENVIRONMENTAL POLLUTION OR SUCCESSFUL UTILIZATION OF SEWAGE. (DIE VERREGNUNG VON KOMMUNALEM ABWAESSERN IM ABWASSERVERBAND BRAUNSCHWEIG - UMWELTVERSCHMUTZUNG ODER SINNVOLLE ABWASSERVERWERTUNG),
Kiel Univ. (West Germany). Inst. fuer Wasserwirtschaft und Meliorationswesen.
For primary bibliographic entry see Field 5B.
W78-08493

THE APPLICATION OF A TIME-SERIES-ANALYSIS IN WATER QUALITY MANAGEMENT (ANWENDUNG EINER ZEITREIHENANALYSE IN DER WASSERGUETEWIRTSCHAFT),
Abteilung Siedlungswasserwirtschaft, Brunswick (West Germany) Inst. fuer Stadtbauwesen.
R. Stegmann, H. Ehrig, and P. Liem.
Wasser und Boden, Vol. 30, No. 3, p 50-54, 1978. 8 fig, 8 ref.

Descriptors: *Analytical techniques, *Time series analysis, *Fourier analysis, *Water supply development, *Water quality control, Rivers, Water management(Applied), Path of pollutants, Water quality, Baseline studies, Waste water disposal, Mathematical studies, Model studies, Environmental effects, Sewage disposal, Planning.

Spectral and Fourier analysis constitute important tools for the description of time series in water quality management. A calculated time series function can be extrapolated to predict changes in water quality. The difference between measured water quality indicators, such as oxygen content and chloride levels, and the extrapolated values can be used to quantify the environmental impact of external factors, such as the construction of a sewage treatment plant or the addition of a new industrial source of pollution. The procedure is used in an example involving water quality data for the Oker River and its tributaries, collected for the years 1965-1973 by the Institute for Urban Studies of the Technical University in Braunschweig, West Germany. Equations expressing the trend and periodicity functions are derived; time series analysis is used to predict the Oker River quality on the basis of trends in dissolved oxygen and chlorine levels. (Kroha-FIRL)
W78-08494

PROBLEMS AND TECHNIQUES FOR THE AERATION SYSTEMS IN SEWAGE WORKS AND SURFACE WATERS--EXPERIENCE WITH INSTREAM AERATION AND OXYGEN MONITORING IN THE RIVER RUHR,
Ruhrverband, Essen (West Germany).
D. Albrecht.
Tribune du CEBEDEAU, Vol. 30, No. 409, p 449-456, December, 1977. 13 fig, 7 ref.

Descriptors: *Dissolved oxygen, *Aeration, *Rivers, *Chlorophyta, *Oxygen sag, Fishkill, Eutrophication, Nutrients, Low-flow augmentation, Low-flow, Reservoir storage, Waste water disposal, Oxygen demand, Water quality control, Municipal wastes.

Instream aeration of the Ruhr River in West Germany has been conducted since 1965 to compensate for oxygen deficiencies during summer months due to the decomposition of dead algae. The Ruhr, with average flows of 75 cu m/sec, sustains low flows of 3-5 cu m/sec over an average of 120 days annually. The water flow is augmented by reservoir water during these periods. The Ruhr also receives treated waste water which comprises up to 36% of the total flow during low flow conditions. Four impounding lakes, providing further treatment of municipal effluent and storm water overflows, reduce effluent BOD from 5.5 to 4.8 mg/liter. Chlorophyll-a algal blooms during summer months depress dissolved oxygen levels to as low as 2 mg/liter; high chlorophyll-a concentrations have resulted in oxygen supersaturation followed by dissolved oxygen depression, a situation leading to fishkill. During 1971-1975, five oxygen monitors were installed along the Ruhr above an instream aeration system which includes: a 47 kg O2/hr floating aerator, a 178 kg O2/hr aerator, two weirs, and a bypass stream. The instream aeration system is activated when the oxygen monitors detect dissolved oxygen concentrations below 4 mg/liter in the upstream waters. Compressed air was found to be more economical than pure oxygen aeration. (Lisk-FIRL)
W78-08495

RESULTS OF POLLUTION CONTROL OF THE RHINE WATER IN RHINELAND-PALATINATE (ERFOLGE BEI DER REINHALTUNG DES RHEINS IN RHEINLAND-PFLAZ),
Landesamt fuer Gewasserkunde, Mainz (West Germany).
E. Hantge.
Wasserwirtschaft, Vol. 67, No. 11, p 348-352, 1977. 7 fig, 1 tab.

Descriptors: *Water quality control, *Pollutants, *Pollution abatement, *Biochemical oxygen demand, *Chromium, Ammonia, Human population, Hydrologic data, Organic wastes, Waste water treatment, Municipal wastes.

Pollution parameters in the Rhineland-Palatinate area of the Rhine River were measured by the West German Hydrologic State Office. The pollution load on the Rhine has been reduced by 90% since 1974, representing a population equivalent to 1.16 million. Water quality parameters measured during the study included BOD, dissolved oxygen, ammonia, chromium, and saprobidity. The pollution load on the Rhine, reduced by 650,000 population equivalents in 1976, was higher in that year than in the previous year due to a 56% increases in runoff. The pollution load was lower within the first 4 mos of 1977 than during 1975 and 1976. The study verified that the water quality of the Rhine since has improved significantly as a result of pollutant load reductions. (Lisk-FIRL)
W78-08496

LEGISLATION NEEDED TO PROMOTE CONSERVATION AND RECYCLING,
Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
D. G. Wilson.
Compost Science, Vol. 18, No. 4, p 13-15, July-August, 1977.

Descriptors: *Legislation, *Pollution taxes(Charges), *Pollution abatement, *Treatment facilities, *Water utilization, Natural resources, Air pollution, Tariff, Waste water treatment, Municipal wastes.

Legislation for regulating environmental pollution proposes that polluters be charged for sewage treatment and those who are affected by the pollution be compensated. An increase in sewer charges is recommended so that adequate waste water treatment can be accomplished. Suggested charges are based on the amount of waste water produced by an individual rather than evenly distributed charges. While sewer charges are usually based on water intake, individuals using water for non-polluting practices, such as irrigation, should be credited rather than taxed for this water usage. Individual waste production charges would encourage the use of water-saving and non-polluting devices, such as composting toilets. Where adequate sewage treatment is unfeasible, it is recommended that waste water charges continue to be collected and utilized in a compensatory fashion. This would include improvement of water supply and recreational facilities for communities located downstream from a pollution source. Long-term effects of pollution may be compensated for by creating national parks or wildlife centers. Other areas affected by pollution that are considered by the proposed legislation include natural resources, air pollution, and water supplies. (Lisk-FIRL)
W78-08497

1984 IS APPROACHING--WHAT DOES IT MEAN TO THE WASTE-WATER SERVICE,
Thames Water Authority, London (England). Metropolitan Public Health Div.
For primary bibliographic entry see Field 5D.
W78-08499

NEW PROSPECTS FOR SEWAGE DISPOSAL IN U P,
Irrigation Commission, Lucknow (India).
For primary bibliographic entry see Field 5E.
W78-08500

CONDUCTING VALUE ENGINEERING STUDIES--THE EXPERIENCE OF FIVE CITIES,
Culp, Wesner, Culp-Clean Water Consultants, El Dorado Hills, CA.
G. Culp.
Water and Sewage Works, Vol. 125, No. 2, p 56-60, February, 1978. 6 tab, 1 ref.

Descriptors: *Cost analysis, *Appraisals, *Engineers estimates, *Evaluation, *Value engineering, Treatment facilities, Construction costs, Economic efficiency, Costs, Waste water treatment, Municipal wastes.

Value engineering reports, required by the EPA for all waste water treatment projects costing more than $10,000, and the subsequent cost reductions of constructing municipal waste treatment plants were reviewed for five cities in which value engineering was employed. The value engineering report on the upgrading of a 3 mgd trickling filter plant indicated a cost savings of $3,843,570, of which $920,000 was implemented. An evaluation of a 70-80% completed 24 mgd activated sludge plant indicated a cost savings of $547,467, of which $274,770 was realized. The third plant, upgraded from 1.6-3.8 mgd capacity, saved $1,404,872 with value engineering. Upgrading of a 115 mgd treatment plant to 200 mgd with nutrient removal operations cost $5,700,000 less than estimated. The fifth project in which two plants with a total capacity of 250 mgd were upgraded to provide nitrification and improved effluent quality, was evaluated as costing $43,600,000 less than estimated; $9,318,000 was saved in construction costs when value engineering was implemented. The value engineering fees ranged from 0.2-0.8% of the total construction costs for each of the five projets. (Lisk-FIRL)
W78-08501

THE PROVISION OF TECHNICAL INFORMATION IN A REGIONAL WATER AUTHORITY,
Severn-Trent Water Authority, Birmingham (England).
M. G. Mathews, and D. W. Hilder.
Journal of the Institution of Water Engineers and Scientists, Vol. 32, No. 1, p 7-18, January, 1978. 1 fig, 5 tab.

Descriptors: *Regional development, *Water pollution control, *River basin commissions, *Analytical techniques, *Data collections, Sampling, Treatment facilities, Water supply, Watershed management, Comprehensive planning, Waste water treatment, Municipal wastes.

Guidelines for water quality data collections and analyses are described for regional planning and records maintained by water authorities. The guidelines are categorized as: water resources, land drainage, reclamation and trade effluent control, water supply, sewerage, general engineering, planning and design, water quality management, recreation, fisheries, and medical. Continuous monitoring of water in water supply sources, waste water treatment plants, and rivers is recommended; samples are referenced according to site, date, time, and type of analyses to be performed. Background information suggested for sewage works includes: flows, discharges, pumping information, economic history, physical statistics, and a complete record of sewers. Further information required for treatment plants involves: the chemical, biological, and bacteriological data; and trade effluent details, such as the strength and volume of the waste, as well as charges and rebates. Computers are forwarded for collating, analyzing, and storing the regional water authority data. (Lisk-FIRL)
W78-08502

DIRECT ENVIRONMENTAL FACTORS AT MUNICIPAL WASTEWATER TREATMENT WORKS--EVALUATION AND CONTROL OF SITE AESTHETICS, AIR POLLUTANTS, NOISE AND OTHER OPERATION AND CONSTRUCTION FACTORS,
R. E. Leffel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 456, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-430/9-76-003, January 1976. 111 p, 20 fig, 14 tab, 104 ref, 1 append.

Descriptors: *Legislation, *Regulation, *Treatment facilities, *Design criteria, *Environmental control, Air pollution, Wildlife habitats, Wetlands, Waste water treatment, Municipal wastes, Water pollution control.

Methodologies of municipal waste water treatment plant design evaluation and planning in compliance with the Federal Water Pollution Control Act Amendment of 1972 (P.L. 92-500) were developed to assist treatment plant designers in achieving cost-effective and environmentally sound projects. Planning and design controls are reviewed for treatment plants, pumping stations, separation structures, interceptors, force mains, collection systems, and outfall sewers. Criteria for controlling noise and air pollution, and providing aesthetic lighting, architecture, site design, and landscaping are presented. Environmental impacts considered in project planning include wildlife, shorelines, wetlands, flood plains, drainage, and construction and operation effects. A compilation and review of reference legislation affecting waste water treatment plants is included in the guidelines. (Lisk-FIRL)
W78-08507

FRESH WATER FROM SEWAGE ON LONG ISLAND,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
For primary bibliographic entry see Field 5D.
W78-08515

HANDBOOK OF WATER RESOURCES AND POLLUTION CONTROL.
For primary bibliographic entry see Field 5D.
W78-08543

EVALUATION OF TECHNIQUES FOR ALGAE REMOVAL FROM WASTEWATER STABILIZATION PONDS, REVIEW PAPER,
Utah State Univ., Logan. Coll. of Engineering; and Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5D.
W78-08544

EROSIONAL REMOVAL OF FALLOUT PLUTONIUM FROM A LARGE MIDWESTERN WATERSHED,
Argonne National Lab., IL. Radiological and Environmental Research Div.
For primary bibliographic entry see Field 4D.
W78-08549

SEASONAL RUNOFF LOSSES OF NITROGEN AND PHOSPHORUS FROM MISSOURI VALLEY LOESS WATERSHEDS,
Agricultural Research Station, Lafayette, IN.
For primary bibliographic entry see Field 5B.
W78-08550

NITRATE, CHLORIDE AND DISSOLVED SOLIDS, OGALLALA AQUIFER, WEST TEXAS,
Texas Tech Univ., Lubbock. Dept. of Geosciences.
For primary bibliographic entry see Field 5B.
W78-08555

PREVENTION OF NITRATE LEAKAGE FROM THE HULA BASIN, ISRAEL: A CASE STUDY IN WATERSHED MANAGEMENT,
Technion-Israel Inst. of Tech., Haifa (Israel). Dept. of Agricultural Engineering.

Y. Avnimelech, S. Dasberg, A. Harpaz, and I. Levin.
Soil Science, Vol. 125, No. 4, p 233-239, April 1978. 4 fig, 2 tab, 17 ref.

Descriptors: *Watershed management, *Nitrates, *Leakage, Leaching, Nitrification, Subsidence, Drainage effects, Water table, Sprinkler irrigation, Basins, Organic soils, Crops, Oxygenation, Drainage systems, Water quality, *Lake Kinneret(Sea of Galilee), *Israel, *Hula Basin(Israel).

Drainage of the Hula basin led to the exposure of about 2,000 ha of organic soils. Corollary to a high subsidence rate, extensive nitrification and leaching of nitrates became evident, endangering the quality of the water in Lake Kinneret (Sea of Galilee). The problem is being solved by (1) improving the drainage system and reducing water flow through the basin; (2) maintaining a relatively high water table during the summer, thus minimizing the depth of the oxidized layer; (3) inducing denitrification through the use of sprinkler irrigation; and (4) selecting crops that reduce the accumulation of nitrates in the soil. (Visocky-ISWS)
W78-08564

HIGH FREEBOARD BARRIER CONSTRUCTION FOR WATER CARRIED POLLUTANTS,
P. Preus.
U.S. Patent No. 4,062,191, 5 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol. 965, No. 2, p 449, December 13, 1977.

Descriptors: *Patents, *Oil pollution, *Water pollution treatment, *Water pollution control, *Water quality control, Barriers, Floating, Containment, Oil booms.

Floating barriers, known generally as oil booms, have been found to have great utility in containing and controlling oil slicks and other water carried pollutants on and in bodies of water. The barriers usually include floatation elements having a depending liquid impervious skirt which, when deployed around or in a controlling position relative to the pollutant, provide means to contain or prevent the pollutant from spreading or moving into uncontaminated areas. This invention is composed of a series of boom sections which are connectable in end to end relationship with each of the boom sections containing a floatation material which comprises an oleophilic-hydrophobic-lighter than water composition which will selectively absorb and/or adsorb hydrocarbons or other pollutants or the floatation means may comprise air inflatable chambers. Flexible draft members and associated connectors are employed to support an upstanding fabric or plastic or fabric and plastic web which increases the freeboard or the boom. (Sinha-OEIS)
W78-08583

WATER CLEANER,
A. S. Calvano.
U.S. Patent No. 4,064,049, 5 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 965, no 3, p 1052, December 20, 1977.

Descriptors: *Patents, *Water pollution treatment, *Water quality control, Water purification, Filtering, Filters, Equipment, Screens.

A water cleaner has a hollow casing containing a water inlet and a water outlet. An elongated tubing is secured to the interior of the casing and contains an inlet and an outlet. The tubing inlet is coupled to the water inlet and the tubing outlet is coupled to the water outlet. A screen surrounds the exterior of the tubing and is secured to it. A filter element surrounds the screen for removing impurities from water passing from the casing inlet to the casing outlet. (Sinha-OEIS)
W78-08592

ALGAE GROWTH CONTROL,
Algard Pty. Ltd., Balwyn (Australia). (Assignee).
R. A. Rigby.
U.S. Patent No. 4,065,386, 4 p, fig, 2 ref; Official Gazette of the United States Patent Office, Vol 965, No 4, p 1487, December 27, 1977.

Descriptors: *Patents, *Water treatment, *Water pollution control, *Water quality control, Industrial water, Algae, Algae control, Magnetic studies, Magnetic fields.

The presence and rapid multiplication of algae organisms in water systems, particularly where water recirculation is involved constitutes a serious economic problem requiring constant attention in industrial systems, and a substantial nuisance in public and private swimming pools. It has been found that the effect of a magnetic field on the water is such as to almost completely render the water unsuitable for the propagation and growth of algae. The device of this invention comprises a duct member incorporated in the water supply duct. Magnetic means placed within the duct creates a magnetic field transverse to the lengthwise direction of the duct. It is equally possible to incorporate permanent or electromagnets about the periphery of the duct and this is particularly desirable where separation of the magnetic material from the water is required. (Sinha - OEIS)
W78-08594

SLIME CONTROL METHOD,
Kurita Water Industries Ltd., Osaka (Japan). (Assignee).
T. Tsuneki, N. Takahashi, and H. Tashiro.
U.S. Patent No. 4,065,387, 4 p, 3 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 965, No 4, p 1487, December 27, 1977.

Descriptors: *Patents, *Water treatment, *Industrial water, Cooling water, Slime, Microorganisms, Water quality control, Bromine, Oxidation.

In industrial water systems such as cooling water systems, paper mill water systems, and the like, there takes place the formation of slime caused by the deposition of microorganisms, inorganic substances and organic substances. On the surface of microorganisms or a floc consisting of an aggregation of microorganisms, there is a sticky substance as an extracellular matrix which is apt to adhere to the surface of solids, and this is the cause of slime formation. The slime control agent of this invention eliminates the adhesiveness of microorganisms by changing the nature of the sticky substances of the extracellular matrix through oxidation with the bromite. This is quite different from the effects of chelating agents or cationic surface active agents. Bromite substances used in this invention demonstrate a high efficiency in controlling the formation of slime when employed in a low range of concentration. In the case of such a low concentration, the bromite substance cannot manifest the effect of killing microorganisms, and accordingly the slime control effect of the bromite is not attributable to a biocidal action. (Sinha - OEIS)
W78-08595

APPARATUS FOR DETECTING PROPORTION OF OIL IN OIL/WATER MIXTURES,
Marine Construction and Design Co., Seattle, WA. (Assignee).
J. L. McGrew.
U.S. Patent No. 4,065,389, 5 p, 1 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 965, No 4, p 1488, December 27, 1977.

Descriptors: *Pollutant identification, *Patents, *Oil pollution, *Oily water, *Water pollution control, *Water quality control, Industrial wastes, Separation techniques, Monitoring, Equipment, Sensing.

In many cases where surface runoff water or industrial process waste or recycling water may become contaminated with oil, continuous or intermittent samplings of water may be adequate without the necessity of passing all of the water through a separator to assure removal of excess oil. This invention is useful in detecting or responding to an excessive proportion of oil in samplings of water. However it is equally effective in conjunction with the continuous or intermittent operation of an oil/waterseparator routinely processing all of the discharging or recycling water in a purification system. By pumping the accumulating oil from an oil ourput sump in the apparatus at a predetermined pumping rate, and by detecting level of oil rising in the sump above the range with the oil pump operating, the system is made responsive to the proportion of oil in the mixture above a certain percentage. Any one or more of various responsive functions may then be initiated such as sounding an alarm, terminating an industrial process, momentarily interrupting operation of the oil/water separator,, etc. (Sinha - OEIS)
W78-08596

BARRIER CONSTRUCTION FOR WATER CARRIED POLLUTANTS,
P. Preus.
U.S. Patent No. 4,065,923, 7 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 966, No 1, p 46, January 3, 1978.

Descriptors: *Patents, *Oil pollution, *Water pollution control, *Water quality control, *Barriers, Floating, Absorption, Oil booms, Containment.

A barrier for water carried pollutants comprises a series of end to end connectable boom sections containing a floatable material which may comprise an oleophilic-hydrophobic-lighter than water composition which will selectively absorb hydrocarbons; fluid impervious connectors for the ends of the boom sections and flexible draft members and associated connectors for maintaining the integrity of the boom if it becomes necessary to replace one or more of the boom sections. (Sinha-OEIS)
W78-08598

BILGE WATER DISPOSAL SYSTEM INCLUDING OIL RECOVERY MEANS,
National Marine Service, Inc., St. Louis, MO. (Assignee).
C. H. Walters, H. J. Barmeier, Jr., and G. E. Sullivan.
U.S. Patent No. 4,066,545, 13 p, 4 fig, 16 ref; Official Gazette of the United States Patent Office, Vol 966, No 1, p 248, January 3, 1978.

Descriptors: *Patents, *Oil pollution, *Oily water, *Water pollution control, *Water quality control, Separation techniques, Evaporation, Equipment, Bilge water, Flash evaporation.

An environmentally protective bilge water disposal system utilizes an inverted dome gravitation oil separator unit in combination with an engine exhaust flash water vaporizer to remove and recover oil contamination from the bilge water prior to its disposal by flash evaporation in the exhaust stack. The system is capable of operating continuously under regulation by an electrical control arrangement that ensure safety of the engine, and shutting down of the system if certain key components do not function in a proper manner. The system includes a pump, an oil separator, control valves and sensors for various operating parameters and mechanical functions of the system, such parameters and functions including bilge fluid level, water pump function, water flow valve function, engine fuel pressure, engine throttle air pressure, engine exhaust stack temperature, separator function, separator dome position, and oil storage level. Processed bilge water from which oil contaminant has been removed may be discharged directly overboard the vessel if

desired. Recovered oil is stored in a suitable oil storage tank aboard the vessel. (Sinha-OEIS)
W78-08608

OIL WELL OPERATION AND SALT-WATER INTRUSION: POLICY IMPLICATIONS,
Cities Service Oil Co., Charleston, WV.
V. Meier.
Industrial Wastes, Vol. 24, No. 2, p 42-45, March-April, 1978.

Descriptors: *Oil wells, *Oil industry, *Oil wastes, *Saline water, *Injection wells, Tenches, Ditches, Brine disposal, Natural gas, Well casings, Storage tanks, Oil water, Groundwater, Drilling, Drilling fluids, Waste water disposal, Industrial wastes.

Regulations and methods to prevent oil, salt water, and waste water intrusion into groundwater during the drilling of oil wells are reviewed. Waste water from oil drilling is generally contained in earthern pits which may be lined with a gel and polymer, plastic, or steel. The volume of waste water is evaporated, pumped into a well annulus, injected into salt water disposa wells, buried in trenches, or applied to land. Defoamed water is settled in a series of pits before it is discharged into streams. Casings for wells are drilled 30-100 ft below the fresh water horizon and lined with cement that can be returned to the surface. Intermixing of oil, gas, fresh, or salt water strata above the source of oil is prevented by cementing and casing. Fuel tanks are contained by dikes; waste oil is collcted in ditches and dikes. Tank overflow and backwash are channeled to plastic-lined pits for evaporation or injection well disposal. Compressor stations or cooling towers treat the gas produced during drilling before it is pumped into pipelines. Oil and grease in cooling streams are skimmed to 10 ppm before discharge; water discharged from drilling operations has an oil content not greater than 50 ppm. (Lisk-FIRL)
W78-08617

DETERMINATION OF POLYTHIONATES AND THIOSULPHATE IN MINING EFFLUENTS AND MILL CIRCUIT SOLUTIONS,
Canada Centre for Mineral and Energy Technology, Ottawa (Ontario).
For primary bibliographic entry see Field 5A.
W78-08625

IMPACT OF NEARSTREAM VEGETATION AND STREAM MORPHOLOGTY ON WATER QUALITY AND STREAM BIOTA,
Illinois Univ. at Urbana-Champaign. Dept. of Ecology, Ethology and Evolution.
J. R. Karr, and I. J. Schlosser.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 652, Price codes: A06 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA 600/3-77-097, August 1977. 90 p, 12 tab, 30 fig, 140 ref.

Descriptors: *Streams, Stream flow, *Stream erosion, *Stream fisheries, *Stream improvement, *Stream stabilization, Sediments, Vegetation, Vegetation, Vegetation effects, Vegetation regrowth, Watershed(Basins), Water pollution, Water quality, Benthos, Freshwater fish, Nutrients, Water temperature, Near stream vegetation, Stream morphology, Stream biota, Reviews.

As man modifies watersheds by removal of natural vegetation and stream channelization, disequilibria in both the terrestrial and aquatic environments result. These disequilibria are the major problem in controlling sediments and nutrients from non-point sources and improving the quality of the stream biota. In this report we review the literature dealing with (1) the possible use of near stream vegetation to reduce the transport of sediment and nutrients from the terrestrial to the aquatic environment and decrease stream temperature fluctuations, (2) the effect of stream morphology on sediment transport, and (3) how near stream vegetation and stream morphology affect the biota of streams. The results of this review suggest proper management of near-stream vegetation and channel morphology can lead to significant improvements in both the water and biological quality of many streams. However, critical research outlined in this report is still necessary if we are to properly use this management alternative to attain the objectives of the Federal Water Pollution Control Act of 1972 (Public Law 92-500). (EIS-Katz)
W78-08634

ENVIRONMENTAL REQUIREMENTS AND POLLUTIN TOLERANCE OF COMMON FRESHWATER CHIRONOMIDAE,
Florida Agricultural and Mechanical Univ., Tallahassee. Lab. of Aquatic Entomology.
For primary bibliographic entry see Field 5C.
W78-08636

CONTROLLED-ENVIRONMENT BIVALVE MOLLUSCAN MARICULTURE,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 2L.
W78-08644

REARING PACIFIC SALMON IN SALTWATER PONDS FERTILIZED WITH DOMESTIC WASTEWATER,
Humboldt State Univ., Arcata, CA.
For primary bibliographic entry see Field 5C.
W78-08645

POTENTIAL EFFECTS ON AQUATIC RESOURCES OF PROCESSING AND/OR CONVERSION OF IOWA COAL,
Iowa Cooperative Fishery Research Unit, Ames.
For primary bibliographic entry see Field 5C.
W78-08648

ECOSYSTEM PROCESSES AND ORGANIC CONTAMINANTS: RESEARCH NEEDS AND AN INTERDISCIPLINARY PERSPECTIVE,
Institute of Ecology, Washington, DC.
J. M. Neuhold, and L. F. Ruggerio.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 129, Price codes: A04 in paper copy, A01 in microfiche. Report NSF/RA-770008, 1977. 44 p, 126 ref.

Descriptors: *Research priorities, *Pollution, *Water pollution effects, Path of pollutants, Methodology, On-site investigations, Toxicity, *Organic wastes, *Ecosystems, Ecotypes, *Planning, Stress, Organic compounds, Organic matter, Organic wastes.

A group of 52 toxicologists and ecologists discuss the problem of organic pollution. Vital and vulnerable ecosystem processes are discussed using the hypotheses that ecosystems include structural and functional elements vital to the function of the ecosystem and vulnerable to the effects of contaminants introduced into that ecosystem. The ability of ecosystem to withstand contamination stress is considered under the major topics: mechanisms of stress, ecosystem sensitivity, and ability to withstand stress. The chemical-ecosystem interface is considered from the specific vantage of chemical dynamics. Long-term effects of organic pollutants on ecosystem are discussed on the premise that metabolism, structure, and behavior are three unifying concepts common to all levels of organization from the cell to an ecosystem. (EIS-Katz)
W78-08649

DEVELOPMENT OF A KIT FOR DETECTION OF HAZARDOUS MATERIAL SPILLS INTO WATERWAYS,
Edgewood Arsenal, Aberdeen Proving Ground, MD.
For primary bibliographic entry see Field 5A.
W78-08658

THE IMPORTANCE OF PREDATION BY CRABS AND FISHES ON BENTHIC INFAUNA IN CHESAPEAKE BAY,
Virginia Inst. of Marine Sciences Gloucester Point.
For primary bibliographic entry see Field 2L.
W78-08692

EVALUATION OF BIOLOGICAL CONTROL OF NUISANCE AQUATIC VEGETATION BY GRASS CARP,
Iowa Conservation Commission, Chariton. Research Station.
L. Mitzner.
Transactions of the American Fisheries Society, Vol. 107, No. 1, p 135-145, 1978, 5 fig, 6 tab, 6 ref.

Descriptors: *Biocontrol, *Carp, *Vegetation, Control, *Vegetation effects, *Plant growth, Plant populations, *Nitrites, *Nitrates, *Biochemical oxygen demand, *Phosphates, *Primary productivity, Fish behavior, Sport fishing, *Growth rates, Animal growth, Biomass, Ecosystems, Biological communities, *Iowa, Ctenopharyngodon, *Grass carp, Red Haw Lake(Iowa).

Grass carp introductions at Red Haw Lake, Iowa resulted in a decrease of aquatic macrophytes from 2,438 g/m2 in 1973 to 211 g/m2 in 1976, with species of Potamogeton, Elodea, Ceratophyllum, and Najas all controlled effectively by grass carp. During 1974-1976 mean nitrites, nitrates, biological oxygen demand, and turbidity showed significant decreases, while alkalinity increased significantly from a mean of 115 mg/liter in 1974 to 132 mg/liter in 1976. Mean concentrations of organic and inorganic phosphates gradually increased during the investigation, but were not statistically different. Average primary production was nearly identical in 1974-1975 at about 2 g carbon/m2/day, but decreased significantly to 1.35 g carbon/m2/day in 1976. Grass carp consumed all major plant groups at the lake with greatest selection for Najas and Potamogeton. Reduction in vegetation biomass by 91% in four years increased the opportunity for anglers to fish from shore. During the investigation popularity of shoreline fishing increased by 241% with catch success remaining greater than 0.70 fish per hour. (EIS-Deal)
W78-08693

FREQUENT IRRIGATION MORE EFFICIENT,
Agricultural Research Service, Peoria, IL.
For primary bibliographic entry see Field 3F.
W78-08716

THE CONTROL OF NITRATE AS A WATER POLLUTANT,
Texas Agricultural Experiment Station, College Station.
A. R. Swoboda.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 893, Price codes: A08 in paper copy, A01 in microfiche. Report EPA-600/2-77-158, August, 1977. 141 p, 16 fig, 55 tab, 14 ref, 3 append.

Descriptors: *Nitrates, *Leaching, Soils, Crop production, *Fertilizers, Fertilization, Nutrients, Lysimeters, *Water pollution control, Nitrification inhibitors, *N-Serve.

This study was based on the premise that the most logical approach to reducing nitrate leaching in soils was to limit the amount of nitrate in the soil solution at any one time. Methods of limiting the

concentration of nitrate in the soil solution while maintaining an adequate supply of available nitrogen for plant growth are reported. Timing of nitrogen application was found to be a very effective meas of reducing nitrate leaching. When nitrogen was applied in the fall as much as 3-fold more nitrate was found to have leached below 60 cm in the soil by June as compared to applications made in March. A nitrification inhibitor, N-Serve, was found to be very effective in reducing the amount of nitrate leached. Slow release sulfur coated ureas and treatment of nitrogen fertlizers with N-Serve were found to be effective means of reducing leaching losses of nitrate whe fertilizers were applied in the fall or winter. (Skogerboe-Colorado State)
W78-08723

STOCHASTIC PREDICTION OF SEDIMENT YIELDS FROM STRIP MINE SPOILS OF THE ARID SOUTHWEST,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 2J.
W78-08729

SOIL EROSION AND SEDIMENT CONTROL ON THE RECLAIMED COAL MINE LANDS OF THE SEMI-ARID SOUTHWEST,
Arizona Univ., Tucson. School of Renewable Resources.
For primary bibliographic entry see Field 4D.
W78-08730

POLLUTANT CONTRIBUTIONS FROM IRRIGATION SURFACE RETURN FLOWS,
Max C. Fleischmann College of Agriculture, Reno, NV.
For primary bibliographic entry see Field 5B.
W78-08743

RECLAMATION OF COAL-MINED LAND IN THE SOUTHWEST,
Rocky Mountain Experiment Station, Denver, CO.
For primary bibliographic entry see Field 4C.
W78-08750

AN ECONOMIC EVALUATION OF CROPLAND USE AS A CONTROL FOR SEDIMENT NONPOINT POLLUTION,
Iowa Agriculture and Home Economics Experiment Station, Ames.
J. C. Wade, and E. O. Heady.
Agriculture and Environment, Vol 3, No 4, p 307-323, October, 1977. 3 tab, 6 fig, 12 ref.

Descriptors: *Sediment control, *River basins, *Model studies, *Alternative costs, *Crop production, Water pollution, Pollutant identification, Water pollution sources, Farm management, Alternate planning, Nonpoint pollution, Cost-benefit ratio, Evaluation.

Concepts involved in developing an evaluation procedure for sediment as a nonpoint pollutant are reviewed. A model of the agricultural production economy, which links crop production to sediment loads and environmental quality, is discussed, using five hypothetical sediment-control alternatives for 18 U.S. river basins, including 5 arid areas: The Rio Grande, the Upper Colorado, the Lower Colorado, the Great Basin, and California. Insight into changes in farm production technologies, incomes, pollution levels, and consumer and producer costs is given by the model. In terms of alternatives, the Minimum Sediment Alternative has an unfavorable benefit-cost ratio, and would require interregional changes in technology and production patterns. The T-Limit Alternative increases production costs and has adminstrative difficulties. The PA-Limit and River Basin Limit Alternatives do not provide a large change in national sediment load over the Unrestricted Alternative. No alternative examined indicates a best sediment control policy. (Popkin-Arizona)
W78-08758

DETERIORATING SEWER LINE RE-LINED IN ARIZONA.
For primary bibliographic entry see Field 8G.
W78-08766

INTERCEPTOR NORTH COMPLETED AHEAD OF SCHEDULE.
For primary bibliographic entry see Field 8F.
W78-08770

TARGET: TOXIN REMOVAL,
Ecodyne Corp., Union, NJ.
A. V. Metzner.
Environmental Science and Technology, Vol. 12, No. 5, May 1978, p 530-533, 4 fig, 2 ref.

Descriptors: *Water pollution control, *Waste water treatment, Ion exchange, Membrane processes, Adsorption, *Toxins, Oxidation, Incineration.

Industry's water clean-up efforts which have focused on reducing suspended solids and BOD content to secondary and tertiary treatment levels, and also on the options available as solutions to the toxin-removal problem. Sources of toxins and problems associated with removal of relatively low levels of these is discussed. Major processes available for treating larger volumes of toxins are identified as being ion exchange, membrane processes, carbon adsorption, and polymeric adsorption. Other methods which are less economical and not so universally applied (ozonation, chemical oxidation, thermal destruction or incineration) are discussed to some extent. (Chilton-ORNL)
W78-08784

PROCEEDINGS OF THE NATIONAL SYMPOSIUM ON SOIL EROSION AND SEDIMENTATION BY WATER.
American Society of Agricultural Engineers, St. Joseph, MI.
For primary bibliographic entry see Field 4D.
W78-08787

CURRENT SOIL EROSION AND SEDIMENT CONTROL TECHNOLOGY FOR RURAL AND URBAN LANDS,
Soil Conservation Service, Washington, DC.
For primary bibliographic entry see Field 4D.
W78-08789

SEDIMENTATION AND EROSION CONTROL IMPLICATIONS FOR WATER QUALITY MANAGEMENT,
Environmental Research Lab., Athens, GA. Technology Development and Applications Branch.
For primary bibliographic entry see Field 4D.
W78-08794

EROSION AND SEDIMENT CONTROL FOR COAL SURFACE MINE AREAS,
Washington Irrigation and Development Co., Centralia.
For primary bibliographic entry see Field 4D.
W78-08799

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

COMPREHENSIVE FLOOD PLAIN STUDIES USING SPATIAL DATA MANAGEMENT TECHNIQUES,
Hydrologic Engineering Center, Davis, CA.
For primary bibliographic entry see Field 6F.
W78-08307

THE USE OF GEOMETRIC PROGRAMMING IN THE DESIGN OF AN ALGERIAN WATER CONVEYANCE SYSTEM,
Becht Corp., San Francisco, CA.
For primary bibliographic entry see Field 4A.
W78-08308

WATER QUALITY MANAGEMENT IN THE HSINTIEN RIVER IN TAIWAN,
Asian Inst. of Tech., Bangkok (Thailand). Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5G.
W78-08309

UNTESTED IDEAS ON A WATERING DEVICE FOR ARID CLIMATES,
F. Hopman.
Southwest Bulletin, New Mexico Solar Energy Association, Vol. 3, No. 5, p 15, May, 1978. 2 fig.

Descriptors: *Arid climates, Dry farming, Water storage, *Water vapor, *Root systems, Soil moisture, Condensation, *Water supply, *Capillary action, Environmental engineering.

The Ajo Lily of the Sonoran Desert conducts heat from its roots to its leaves, where the heat is radiated off at night. As the temperature of the surrounding soil remains warmer than the plant, the plant roots are able to condense water vapor from the surrounding soil. A moisture-condensing device for arid lands farming is proposed, based on the Ajo Lily's water gathering techniques. Two line drawings illustrating the suggested moisture collecting device, include these features: (1) a white radiator-reflector in the shape of a Y designed to shade plants with a trough to attravct and retain dew and/or rain under favorable conditions; (2) a stem, planned so that moisture drains a distance of eight feet into the soil, making moisture accessible to plants with capillary roots. Stem also conducts heat into the trough where it is radiated off. Suggested construction materials for the 'Y' include: (1) junk car metal, painted white; (2) high density concrete, painted white; and (3) high-density ceramic. (Jewkes-Arizona)
W78-08363

THE SANIBEL REPORT: FORMULATION OF A COMPREHENSIVE PLAN BASED ON NATURAL SYSTEMS,
Conservation Foundation, Washington, DC.
For primary bibliographic entry see Field 6B.
W78-08398

ENERGETICS: SYSTEMS ANALYSIS WITH APPLICATION TO WATER RESOURCES PLANNING AND DECISION MAKING,
C. D. Meyers.
IWR Contract Report 77-6, Army Engineer Institute for Water Resources, Fort Belvoir, Virginia, December 1977. 42 p, 27 ref.

Descriptors: *Energetics, *Water resources development, *Environmental assessment, *Planning, *Decision making, Systems analysis, Mathematical models, Simulation analysis, Computers, Energy Cost-benefit analysis, Investment

ratio, Net energy, Energy yield ratio, Energy units, Energy quality, Quantification, Natural values.

Energetics is evaluated as a possible analytical tool for use in water resources planning and decision making. Basic scientific concepts which comprise the comprehensive subject of energetics are explained through the use of easily understandable correlaries. Examined are the potential which these concepts have in water resources work as well as the limitations which curtail their present useability and acceptance. It is concluded that energetics has promise as an analytical tool for assessing environmental quality in general and water resources in specific. So far, no other proposed analytic technique has the promise energetics has for total environmental assessment which includes quantification of values of natural systems. However, energetics is a data-limited tool, its major drawback. (Bell-Cornell)
W78-08423

ANALYSIS OF EXPENDITURES FOR OUTDOOR RECREATION AT THE MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM,
Oklahoma Agricultural Experiment Station, Stillwater.
For primary bibliographic entry see Field 6B.
W78-08424

AGRICULTURAL WATER DEMANDS: PRELIMINARY RESULTS OF SILISTRA CASE STUDY,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6D.
W78-08428

MULTI-OBJECTIVE PLANNING FOR WATER RESOURCES MANAGEMENT,
Melbourne Univ., Parkville (Australia). Centre for Environmental Studies.
For primary bibliographic entry see Field 6B.
W78-08429

MULTI-OBJECTIVE PLANNING FOR WATER RESOURCES MANAGEMENT - REVIEW OF RECENT DEVELOPMENTS IN THE U.S.A.,
Melbourne Univ., Parkville (Australia). Centre for Environmental Studies.
W. T. O'Brien.
Research Project No 72/47, Technical Paper No 29, Australian Water Resources Council, Department of National Resources, Australian Government Publishing Service, Canberra, 1977. 84 p, 8 tab, 5 ref, 3 append.

Descriptors: *Multiobjective, *Planning, *Water resources development, *United States, *Standards, Water management(Applied), Water policy, Land resources, Environmental control, Constrained maximization approach, Benefit maximization, Cost sharing.

A review is presented of recent developments in the application of the U.S. Principles and Standards for planning water and related land resources. This report follows an earlier paper (O'Brien at al, 1977) which examined the Principles and Standards for its suitability as a possible starting point in the development of a set of planning guidelines relevant to Australian conditions. Discussed are several studies on planning policy, undertaken by the U.S. Water Resources Council, which have investigated various policy options for the objectives, discount rate, and cost sharing arrangements used in the Principles and Standards. Discussed are a multi-objective approach, integrated objective approach, and constrained economic maximization approach. Outlined are studies made on the integration of Environmental Impact Statement requirements of the National Environmental Policy Act of 1969 into the planning requirements of the Principles and Standards. Finally, this report reviews the development and application of procedures to implement the Principles and Standards by the U.S. Army Corps of Engineers. Outlined are major policy issues arising from these studies, and the implications for Australia are summarized. (Bell-Cornell)
W78-08430

DIRECT ENVIRONMENTAL FACTORS AT MUNICIPAL WASTEWATER TREATMENT WORKS--EVALUATION AND CONTROL OF SITE AESTHETICS, AIR POLLUTANTS, NOISE AND OTHER OPERATION AND CONSTRUCTION FACTORS,
For primary bibliographic entry see Field 5G.
W78-08507

A UTILITY CRITERION FOR REAL-TIME RESERVOIR OPERATION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources; and Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 4A.
W78-08732

6B. Evaluation Process

THE PREOPERATIONAL EFFECTS OF A WATER-RESOURCES PROJECT ON PROPERTY PRICES,
Ottawa Univ. (Ontario). Geography and Regional Planning.
P. F. Ricci, R. E. Laessig, and E. R. Glaser.
Water Resources Bulletin, Vol. 14, No. 3, p 524-531, June 1978. 3 fig, 12 ref.

Descriptors: *Water resources, *Projects, Effects, Properties, *Prices, *Time series analysis, Economic analysis, Consumer surplus, Park-lake systems, State parks, Recreation, Land market, Statistical methods, *Property values, *Pennsylvania, *Philadelphia(Penn).

Using time series analysis, residential properties nearby a park-lake system, Nockamixon State Park at the fringe of the Philadelphia Metropolitan Area, have been studied to detect possible changes in the land market during the period between announcement and completion of the impounding reservoir, 1962 to 1973. The analysis identifies a period of increases in the values of properties which is concomitant with the announcement of the park-lake. This is followed by a second period characterized by lower prices, which ends in 1970, as construction activities take place. During construction, from 1970 to 1973, property values have been found to increase rapidly. (Graf-Cornell)
W78-08305

FLORIDA KEYS COASTAL ZONE MANAGEMENT STUDY.
Florida Dept. of Natural Resources, Tallahassee. Coastal Coordinating Council.
June 1974, 18 p.

Descriptors: *Florida, *Resources development, *Land management, *Coasts, Water law, Water, Resources, Zoning, Land use, Land resources, Environmental control, Coral, Septic tanks, Liquid wastes, Urban runoff, Dredging, Vegetation, Economic prediction, Environmental effect, Planning.

Florida statutes charge the Coastal Coordinating Council with development of a comprehensive plan for development, protection and zoning of the coastal zone. In response to this mandate, the National Coastal Zone Management Act of 1972, and a request from the governor, this study was conducted. This publication summarizes the Florida Keys Coastal Zone Management Study. The study condenses major findings and recommendations and contains an overview of the basic biophysical, socio-economic, environmental quality, planning and management factors involved in the management of public resources in the Florida Keys. The study includes recommendations as to biophysical and environmental quality. These relate to: (1) coral reefs; (2) liquid waste management; (3) solid waste disposal; (4) urban runoff; (5) dredge and fill activities; and, (6) destruction of natural vegetation. Among the socio-economic conditions examined are: (1) land use analysis; (2) public support services; (3) land ownership; (4) Monroe County economy; (5) population growth trends; and (6) attitude and information study. An introduction contains the essence of policy planning, prerequisites for a Keys policy plan, and a map of the study area. (Quarles-Florida)
W78-08331

MINNESOTA WATER QUALITY: A REPORT TO THE CONGRESS OF THE UNITED STATES BY THE STATE OF MINNESOTA PURSUANT TO SECTION 305(B) OF THE FEDERAL WATER POLLUTION CONTROL ACT,
Mianesota Pollution Control Agency, Roseville.
For primary bibliographic entry see Field 5G.
W78-08387

A DECADE OF NONDEGRADATION POLICY IN CONGRESS AND THE COURTS: THE ERRATIC PURSUIT OF CLEAR AIR AND CLEAN WATER,
Iowa Univ., Iowa City. Coll. of Law.
For primary bibliographic entry see Field 5G.
W78-08393

AN EXAMINATION OF PROBLEMS AND POTENTIALS FOR FUTURE LARGE-SCALE INTENSIVE SEAWEED CULTURE SYSTEMS,
Massachusetts Univ., Wareham. Aquacultural Engineering Lab.
For primary bibliographic entry see Field 6C.
W78-08396

THE SANIBEL REPORT: FORMULATION OF A COMPREHENSIVE PLAN BASED ON NATURAL SYSTEMS,
Conservation Foundation, Washington, DC.
J. Clark.
The Conservation Foundation, Washington, D.C., 1976. 305 p.

Descriptors: *Planning, *Florida, *Land use, *Land management, Long-term planning, Biological communities, Ecosystems, Wetlands, Construction, Land development, Natural resources, *Sanibel Island(Florida).

Carrying capacity for the natural systems of Sanibel Island, Florida, were determined and used in formulating a comprehensive land-use plan that controlled growth and preserved environmental values. Part I of the report presents a brief history of the island, from settlement to incorporation. Part II presents the natural systems study with an analysis of the island's ecosystem, identification of the major ecological zones (water, interior wetlands, mangrove swamps, uplands, beachfront), diagnosis of the condition of these zones, and management suggestions. Part III consists of two chapters: the first reports on the planning process of the Sanibel Plan; the second presents an abridged version of the final plan. Appendixes cover the hydrology, vegetation, beach geology, wildlife ecology, estuarine ecology, and natural systems of the island. (Steiner-Mass)
W78-08398

ENERGETICS: SYSTEMS ANALYSIS WITH APPLICATION TO WATER RESOURCES PLANNING AND DECISION MAKING,
For primary bibliographic entry see Field 6A.

W78-08423

ANALYSIS OF EXPENDITURES FOR OUTDOOR RECREATION AT THE MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM,
Oklahoma Agricultural Experiment Station, Stillwater.
D. D. Badger, D. F. Schreiner, and R. W. Presley.
IWR Contract Report 77-4, Army Engineer Institute for Water Resources, Fort Belvoir, Va., December 1977. 145 p, 4 fig, 66 tab, 5 append.

Descriptors: *River systems, *Recreation, *McClellan-Kerr River Project, *Economic effects, *Assessment, Management, Environmental effects, Data collections, Expenditures, Investment, Water policy, Recreational use, Socio-economic aspects, Methodology, Input-output analysis, Regional analysis, Mathematical models, Dams, Reservoirs, Navigation, Systems analysis.

Data are presented on expenditures for water-related outdoor recreation by users of the McClellan-Kerr Arkansas River Navigation system. The system includes several multiple-purpose lakes and a navigation channel. Current recreational use is over 27 million visits per year, and expenditures average about $10 per visitor day, wit visitors originating primarily from Arkansas and Oklahoma. Assessment of the economic impacts of the expenditure data gathered herein are made by the Institute for Water Resources, utilizing a four-region, interregional input-output model. Water recreation and related land based recreation have increased significantly in economic importance in recent years. A major management problem is the increasing imbalance in the overuse-underuse syndrome long prevalent at lakes in the southwestern United States. The socio-economic and expenditure data on recreationists and seasonal and permanent homeowners around the lakes, locks, and dams were obtained by personal interview. (Bell-Cornell)
W78-08424

MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM; HYDROELECTRIC POWER GENERATION.
Institute for Water Resources (Army), Fort Belvoir, VA.
For primary bibliographic entry see Field 8C.
W78-08425

POPULATION CHANGE, MIGRATION AND DISPLACEMENT ALONG THE MCCLELLAN-KERR RIVER NAVIGATION SYSTEM,
Missouri Univ.-Columbia. Dept. of Sociology.
R. R. Campbell, G. J. Stangler, G. H. Dailey, Jr., and R. L. McNamara.
IWR Contract Report 77-5, U.S. Army Engineer Institute for Water Resources, Fort Belvoir, Va., December 1977. 116 p, 7 fig, 6 tab, 36 ref, 3 append.

Descriptors: *River systems, *McClellan-Kerr Waterway, *Demographic impact, *Economic effects, *Migration, Benefits, Reservoir construction, Property acquisition, Displacement, Population change, Arkansas, Oklahoma, Methodology.

An investigation was made of demographic impact resulting from the McClellan-Kerr River Project, a major Corps of Engineer system of multi-purpose lakes and navigation channels. The major conclusion drawn is that the waterways are a major factor in the large net migration rate into the area; distinguishing characteristics between migrants and residents are noted. The project has provided a potential mechanism for economic development and improved amenities for residential and industrial location; the composition of the population is changing in favor of higher educational, occupational, and income levels as migrants move to the area. The project thus far has been a complete success in many aspects; but care must be taken to consider the costs associated with unused potential and misdirected efforts. (Bell-Cornell)
W78-08426

MULTI-OBJECTIVE PLANNING FOR WATER RESOURCES MANAGEMENT,
Melbourne Univ., Parkville (Australia). Centre for Environmental Studies.
W. T. O'Brien, A. A. Thornley, and A. S. Atkins.
Research Project No 72/47, Technical Paper No 27, Department of National Resources, Australian Water Resources Council, Australian Government Publishing Service, Canberra, 1977. 156 p, 13 fig, 30 tab, 3 map, 46 ref, 2 append.

Descriptors: *Multiobjective, *Planning, *Water resources development, *Standards, Water management(Applied), Land resources, Projects, Cost-benefit analysis, Evaluation, Economics, Effects, Environmental effects, Measurement, Cost allocation, Cost sharing, Mathematical models, Systems analysis, Irrigation, Salinity, *Australia.

The basic concepts and theory of multi-objective planning are outlined, showing that the evaluation component of this planning process has been developed as an extension of benefit-cost analysis to provide better assessments of non-monetary as well as monetary project effects. The historical development of multi-objective planning of water resources in the United States is reviewed; in response to changing community values, there has been a marked shift in water planning from almost sole emphasis on national economic efficiency to the multi-objective approach used in the present Principles and Standards for Planning Water and Related Land Resources (1973). The Principles and Standards are reviewed for their suitability as a possible starting point in the development of a set of guidelines for water resources planning in Australia. Planning objectives, evaluation of economic, environmental and social effects, public participation, cost allocation and cost sharing procedures are considered and possible modifications more appropriate to Australian conditions are presented. The relationship between multiobjective planning and the preparation of environmental impact statements is discussed. Summarized is a case study involving the multiobjective assessment of alternative means to reduce waterlogging and salinity in the Nagiloc-Colignan irrigation area of Australia. Case study conclusions include: multiobjective planning provided a comprehensive and systematic framework for insuring the formulation of a wide range of alternative plans to meet problems and needs of water management in the study area. (Bell-Cornell)
W78-08429

MULTI-OBJECTIVE PLANNING FOR WATER RESOURCES MANAGEMENT - REVIEW OF RECENT DEVELOPMENTS IN THE U.S.A.,
Melbourne Univ., Parkville (Australia). Centre for Environmental Studies.
For primary bibliographic entry see Field 6A.
W78-08430

THE PROVISION OF TECHNICAL INFORMATION IN A REGIONAL WATER AUTHORITY,
Severn-Trent Water Authority, Birmingham (England).
For primary bibliographic entry see Field 5G.
W78-08502

PHASE II, ARIZONA STATE WATER PLAN: ALTERNATIVE FUTURES,
Arizona Water Commission, Phoenix.
C. L. Linser.
February 1977. 145 p, 45 fig, 28 tab, 60 ref.

Descriptors: *Arizona, *Water resources development, *Competing uses, *Alternative planning, *Water conservation, Economic impact, *Groundwater mining, Land use, *Water management(Applied), Mineral industry, Withdrawal, Evaluation, Electric power, Bibliographies, Energy transfer, Surface-groundwater relationships, Water requirements, Water rights, Irrigated land, Wildlife, Industrial water, Water quality, Urban hydrology.

This second report, in a series of three, presents alternative plans for the development of water resources in the State of Arizona for the next 50 years. Significant factors are suggested as having particular impact upon current and future water supplies and water uses for each Arizona county. Potential problems discussed include: (1) increased urban water use, (2) possible expanded water use in the copper industry, (3) possible expanded water use for electrical power, and (4) probable increase in agricultural water use for irrigation. Alternative water use plans are presented, emphasizing the consequences of continued unlimited expansion of groundwater mining of Arizona's diminishing water resources. Planning suggests that only strict water conservation measures can prevent the continuation of the current groundwater overdraft. County water resources and land use are illustrated by numerous figures and tables. (See also W77-04782) (Jewkes-Arizona)
W78-08725

ARIZONA WATER POLICY: CHANGING DECISION AGENDAS AND POLITICAL STYLES,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 6E.
W78-08727

AN ECONOMIC ANALYSIS OF THE CENTRAL ARIZONA PROJECT,
Arizona Univ., Tucson. Dept. of Economics.
J. L. Barr, and D. E. Pingry.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 7. Proceedings, Meetins of the American Water Resouces Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, April 15-16, 1977, Las Vegas, Nevada, p. 15-27, 6 tab.

Descriptors: *Economics, Annual benefits, *Capital, Costs, *Cost analysis, *Electric power costs, Debt, Financing, Return(Monetary), Water requirements, Project planning, *Simulation, *Cost repayment, *Arizona, *Central Arizona Project.

An economic evaluation of the Central Arizona Project was conducted with a goal of developing a simulation model of CAP costs, water operations and capital repayment alternatives. This model was compared to the actual cost experience of the Metropolitan Water District of Southern California for a realistic assessment. In addition, an effort was made to consider some of the indirect impacts of the CAP, and the overall economic outlook was summarized. In devising the simulation model CAP capital costs, CAP power supply and CAP water supply factors were considered along with user charges, management alternatives, and operations, maintenance and repair costs. (Payton-Arizona)
W78-08728

PROCEEDINGS OF THE NATIONAL SYMPOSIUM ON SOIL EROSION AND SEDIMENTATION BY WATER.
American Society of Agricultural Engineers, St. Joseph, MI.
For primary bibliographic entry see Field 4D.
W78-08787

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

THE PREOPERATIONAL EFFECTS OF A WATER-RESOURCES PROJECT ON PROPERTY PRICES,
Ottawa Univ. (Ontario). Geography and Regional Planning.
For primary bibliographic entry see Field 6B.
W78-08305

WATER PRICE RESPONSIVENESS OF COMMERCIAL ESTABLISHMENTS,
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
G. D. Lynne, W. G. Luppold, and C. Kiker.
Water Resources Bulletin, Vol. 14, No. 3, p 719-729, June 1978. 1 tab, 13 ref.

Descriptors: *Water policy, *Pricing, *Water demand, *Commerical firms, *Statistical model, *Miami(Fla), Regression analysis, Price elasticities, Production function, Costs, Estimating, Department stores, Restaurants, Hotels, Motels, Grocery stores, Linear model, Constraints, Equations, Systems analysis.

Pricing policy in water allocation has become of more concern as some areas find water is indeed a scarce resourse. Demand estimates, where the quantity purchased-value in use relationships are of concern, have been made in other studies for residential, industrial, and agricultural uses in many areas of the country. The price-quantity relations for water use in commercial firms are estimated and discussed for several different types of stores. A derived demand model is used to estimate commercial demand in the Miami, Florida area. The price elasticity is found to be generally low (inelastic) for all groups studied, except for the department stores; this group is found to have an elastic demand for water at all prices above $0.93 per thousand gallons purchased per month, where the mean price for this part of the sample was $1.24. The major implication of the study is that commercial establishments may be responsive to price changes over the long run; also, different establishments will respond differently to price changes. (Graf-Cornell)
W78-08306

THE COST OF WATER SUPPLY AND WATER UTILITY MANAGEMENT (VOLUMES I AND II),
Municipal Environmental Research Lab., Cincinnati, OH. Water Supply Research Div.
For primary bibliographic entry see Field 5G.
W78-08390

AN EXAMINATION OF PROBLEMS AND POTENTIALS FOR FUTURE LARGE-SCALE INTENSIVE SEAWEED CULTURE SYSTEMS,
Massachusetts Univ., Wareham. Aquacultural Engineering Lab.
J. E. Huguenin.
Aquaculture, Vol 9, No 4, p 313-342, December 1976. 6 fig, 5 tab, 62 ref. Massachusetts Institute of Technology, Sea Grant Program 04-5-158-1.

Descriptors: *Aquiculture, *Seaweed, *Algae, *Hydroponics, *Rhodophyta, Economics, Cost analysis, Nutrient removal, Tertiary treatment, Raceways, Beneficial use, Gracilaria foliifera, Eucheuma, Hypnea musciformis, Neoagardhiella baileyi, Rhodymenia palmata, Carrageenans, Harvesting of algae, Nutrients.

The commercial feasibility of large-scale seaweed culturing is evaluated based on its marketable potential and engineering characteristics, and the design and operational requirements of a useable culturing system are explored. The two basic approaches to large-scale culturing are: (1) use of estuaries, bays, or ponds for growing the seaweed on nets and ropes (particularly in Japan and the southwest Pacific); and (2) unattached mass culturing of seaweeds in man-made raceways (the primary method in the United States). Of the second type, the most promising configuration consists of raceways with either a V-shaped cross-section or a perpendicular wall with a sloping bottom, both with water circulated by oilless compressed air. A 10-m wide V-shaped raceway terminating in short perpendicular walls is examined in this study. It has 20-degree sloping bottom sections and a cross-sectional area of 10.9 sq m. The raceway surface is epoxy-coated asphalt, and air is delivered at 1 standard cu ft/min of air per foot of raceway. To produce 1000 metric tons/yr dried seaweed, about 10,000 m of raceways would be required; the raceways could be divided into two sets of twenty 250-m long raceways. Species with the most potential are red algae (Rhodophyta), such as Neoagardhiella baileyi, Gracilaria foliifera, Hypnea musciformis, Eucheuma sp, and Rhodymenia palmata. Problems and costs are discussed. (Lynch-Wisconsin)
W78-08396

ESTIMATED VALUES FOR SELECTED WATER HYACINTH BYPRODUCTS,
Georgia Univ., Athens. Dept. of Agricultural Economics.
M. J. Mara.
Economic Botany, Vol. 30, No. 4, p 383-387, October-December, 1976. 2 fig, 16 ref.

Descriptors: *Water hyacinth, *Market value, *Byproducts, Evaluation, Aquatic weeds, Soil amendments, Compost, Cattle feed.

Attempts were made to measure the demand for selected water hyacinth byproducts--compost, soil amendment, and feed ingredient in beef cattle diets. An upper limit on the value of water hyacinths, when used in a compost blend, was determined to be $6.42/wet ton. Only a very limited quantity could be used in this manner. It is doubtful that the value as a soil amendment would cover the cost of transporting and spreading the hyacinths. There has been increased potential demand for water hyacinths as a feed ingredient due to increased prices in other feed ingredients, but the quantity demanded is not very significant. These results suggest that by-products from water hyacinths have little value and offer little help in defraying harvesting costs. (Stihler-Mass)
W78-08415

6D. Water Demand

AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA USING REMOTE SENSING TECHNIQUES,
California Univ., Berkeley.
For primary bibliographic entry see Field 4A.
W78-08244

DETERMINING THE USEFULNESS OF REMOTE SENSING FOR ESTIMATING AGRICULTURAL WATER DEMAND IN CALIFORNIA,
California Univ.-Berkeley. Remote Sensing Research Program.
For primary bibliographic entry see Field 3F.
W78-08256

WATER PRICE RESPONSIVENESS OF COMMERCIAL ESTABLISHMENTS,
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.
For primary bibliographic entry see Field 6C.
W78-08306

AGRICULTURAL WATER DEMANDS: PRELIMINARY RESULTS OF SILISTRA CASE STUDY,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
I. V. Gouevsky, and D. R. Maidment.
Research Memorandum RM-77-44, International Institute for Applied Systems Analysis, Laxenburg, Austria, September 1977. 91 p, 14 fig, 25 tab, 4 ref, 5 append.

Descriptors: *Water demand, *Irrigation, *Linear programming, *Benefit maximization, *Economic efficiency, Optimization, Water supply, Crop yield, Agriculture, Mathematical models, Equations, Systems analysis.

Preliminary results of the Silistra Water for Irrigation Model (SWIM) for determining agricultural water demands in the Silistra region of Bulgaria are presented. For various areas of irrigated and nonirrigated land, and various volumes of water supply, SWIM uses linear programming to select the optimal combination of crop areas and production inputs so as to maximize annual net benefits from crop production in excess of target production quantities of each crop. Both normal and dry weather conditions are examined. The region's import-export balance is investigated for areas of irrigated land between 10,000 and 50,000 hectares, and it is shown that total costs of crop production are minimized at the point when the region is self-sufficient in crop production. By means of demand curves, it is demonstrated that the marginal values of land and water for irrigation are greater than their unit costs of development so that it is optimal to develop irrigation to the maximum area considered by the model. (Bell-Cornell)
W78-08428

6E. Water Law and Institutions

GRACI V. UNITED STATES (LIABILITY OF UNITED STATES FOR FLOOD DAMAGE).
435 F. Supp., p. 189-196 (E.D. La. 1977).

Descriptors: *Louisiana, *United States, *Floods, *Mississippi River, *Negligence, *Flood damage, *Storms, Navigation, Gulf of Mexico, Marshes, Levees, Bayous, Tributaries, Navigable waters, Flood control, Storm surge, Water levels, Canals, Hurricanes, Flood-water.

Plaintiff land owners brought suit against the United States seeking to recover for damages arising from flooding. Plaintiffs contended that defendent was negligent in designing, constructing, and operating the Mississippi River Gulf Outlet which resulted in the flooding of plaintiffs' land during a hurricane. The residential area in which plaintiffs' lands are located was, at the time of the storm, enclosed by a levee. Surrounding the area on its various sides are the Mississippi River, a canal, a lake, an intercoastal waterway, marshland, and the Mississippi River Gulf Outlet. When Hurricane Betsy struck the Louisiana coastline, the levee protecting the plaintiffs' property eventually collapsed as a result of the massive flooding caused by the hurricane. The United States District Court, Eastern District Louisiana, held that the defendant was not liable for the flooding damage of plaintiffs' lands. The court found that the Mississippi River Gulf Outlet was built and maintained as an aid to navigation, not to facilitate flood control. Plaintiffs failed to show any causal connection between the Outlet and any damages sustained by them. (Quarles-Florida)
W78-08201

STATE OWNERSHIP OF LAKE AND RIVER BEDS; TAKING OF SAND AND GRAVEL.
S.D. Comp. Laws Ann. secs 5-2-4 thru 5-2-8 (1974).

Descriptors: *South Dakota, *Lake beds, *Mining, *River beds, *State jurisdiction, Beds,

Gravels, Legislation, Minera industry, Navigation, Navigable rivers, Quarries, Riparian rights, Sands, Streambeds, Administrative agencies, Contracts, Channels, Penalties(Legal).

The bed and channel of any lake or river in South Dakota or bordering on South Dakota to the middle of the main channel as well as all islands and sand bars lying in any lakes or river shall be considered the property of the state unless the state or the United States has conveyed an adverse legal or equitable interest. This provision shall not affect or impair the rights of riparian owners. It shall be unlawful for any person to take from, within, or beneath the bed of any navigable river or lake or any other material except by authorization of the commissioner of the board of school and public lands. Such person shall first enter into a contract with the commissioner upon such terms and conditions as the board may determine. No contract shall be made giving any person any exclusive privilege. Provisions are set forth regarding rules and conditions governing contracts, proceeds of the contracts, and penalties for unlawful taking of materials from lake or river beds. (Jordan-Florida)
W78-08202

PROTECTION OF FISHING WATERS.
S.D. Comp. Laws Ann. secs 41-13-1 thru 41-13-5 (1967).

Descriptors: *South Dakota, *Chemicals, *Fish conservation, *Wastes, Chemical wastes, Fish, Fish management, Fishing, Herbicides, Law enforcement, Legislation, Regulation, Sawdust, Sediments, Water policy, Water quality, Wildlife conservation, Aquatic environment, Pollutants.

It shall be unlawful for any person to empty or allow to be placed, any sawdust, manure, refuse matter, sedimentary materials, or chemicals of any kind into the waters of South Dakota containing game fish, or to deposit same within such distance that it may be carried into such waters by natural causes. It shall be also unlawful to place chemicals into the public waters of South Dakota containing game fish for the purpose of controlling plants, unless explicit authorization to do so is obtained from the game, fish and parks commission. Furthermore, it shall be unlawful for any person to transplant any fish or fish eggs into any of the public waters of this state without the permission of the commission. Finally, it shall be unlawful for any person to empty the contents of any receptacle containing bail into any of the public waters of South Dakota. However, the commission may remove and dispose of rough fish and bullheads by the use of seines, nets, chemicals or by any other means of devices when in its' discretion the same is necessary or advisable. (Jordan-Florida)
W78-08203

SOIL EROSION AND SEDIMENTATION CONTROL ACT OF 1972.
Mich. Comp. Laws Ann. secs 282.101 thru 282.117 (1967), as amended, (Supp. 1977).

Descriptors: *Michigan, *Legislation, *Soil erosion, *Land use, *Sedimentation, Erosion, Degradation(Stream), Soil conservation, Surface runoff, Soil management, Land management, Stream erosion, Land development, Land resources, State governments, Local governments, Governmental interrelations, Administrative agencies, Regulation.

Michigan's department of agriculture shall submit to the water resources commission of the department of natural resources a statewide program to control soil erosion and sedimentation. Land uses which may be governed, shall be identified and recommendation, guidelines, and specifications shall be included. Rules for the control program, including review and approval of site plans, land use plans, and permits for erosion and sedimentation control, shall of promulgated by the commission. Counties are responsible for the enforcement of the rules, except in municipalities with conforming ordinances. Municipalities may enact soil erosion and sedimentation control ordinances more restrictive than this act; but ordinances not complying with minimum requirements shall have no effect. The commission shall be notified of all violations of this act. Bonds may be required as a condition for issuance of permits. State, local, or county agencies may be authorized by the commission to approve soil erosion and sedimentation control procedures. All preliminary plats submitted after June 30, 1974 must contain a statement of compliance with this act. In addition, all final plats shall include evidence of that permit from the appropriate enforcing agency has been obtained and that the requirements of the act will be followed. (Malefatto-Florida)
W78-08204

WATERWAYS AND MILLDAMS.
Ky. Rev. Stat. Ann. sec 182.170 (Supp. 1976).

Descriptors: *Kentucky, *Damsites, *Condemnation, *Eminent domain, *Canals, Dams, Construction, Legislation, Local governments, Mills, Milldams, State governments, Structures, Riparian rights, Public benefits, Public access, Watercourses(Legal), Land use.

In order to build a mill or factory useful to the public in Kentucky, any person owning land on a watercourse may acquire by condemnation sufficient land to build a dam in or across the watercourse. Land may also be acquired to raise an established dam or to cut or enlarge a canal above or below the proposed structure site. Condemnation proceedings shall be brought in the county in which the largest part of the land to be condemned is located, and shall include all the land to be condemned, whether the land is completely within that county or not. (Easterbrook-Florida)
W78-08205

WILD RIVERS SYSTEMS.
Ky. Rev. Stat. Ann. secs 146.210 thru 146.360 (Supp 1976).

Descriptors: *Kentucky, *Wild River Act, *River systems, *Land use, *Wild rivers, *Natural resources, Streamflow, State governments, River flow, Dredging, Agriculture, Strip mines, Roads, Water management(Applied), Recreation, Preservation, Legislation, Streams, Conservation, Environment, Rivers, Penalties(Legal).

In order to preserve certain streams and watercourses in their natural state, the Kentucky legislature has established a wild rivers system. The act establishes a wild river system. The act establishes a wild river system by designating certain streams for immediate inclusion in the system and prescribing the procedures for administration of the system. The system is to be administered by the department for natural resources and environmental protection. The secretary of the department is authorized to establish such reasonable regulations as are necessary to preserve the streams in their primitive state. Primary emphasis shall be given to protecting esthetic, scenic, historic, archaeologic, and scientific features of the area. The secretary shall publicize and hold public hearings on all management plans developed. The act also authorizes the secretary to acquire whatever land tiles as are necessary to protect streams within the system. Land uses that are allowed within the boundaries of a protected area must apply to the secretary before engaging in selected land uses. Procedures are established for the processing of applications and penalties for noncompliance are also provided. (Quarles-Florida)
W78-08206

WATER RIGHTS.
Mont. Const. art. IX sec 3 (1972).

Descriptors: *Water rights, *Montana, *Appropriation, *Beneficial use, *Administration, Legal aspects, Meteoric water, Canals, Ditches, Controlled drainage, Flumes, Aqueducts, Reservoirs, Surface waters, Flood discharge, Groundwater, Right-of-way, Water storage, Water control, Legislation.

All existing water rights are recognized and confirmed if they serve a useful or beneficial purpose. The use of all water, whether appropriated now or in the future for any beneficial use, the right of way across the lands of others needed in connection with any beneficial use and the reservoir necessary for collecting and storing water shall be held to be a public use. All waters of the state, including surface, underground, flood and atmospheric waters, belong to the state and may be appropriated for such beneficial uses as are provided by law. The legislature shall provide for the administration, control and regulation of water rights. The legislature shall also establish a central system of record keeping in addition to the present system of local records. (Beamer-Florida)
W78-08207

FLOODWAY MANAGEMENT AND REGULATION.
Mont. Rev. Code secs 89-3501 thru 89-3515 (Supp. 1975).

Descriptors: *Flood plains, *Floodways, *Flood protection, *Water management(Applied), *Montana, Flood control, Flood data, Flood forecasting, Flood frequency, Flood plain zoning, Routing, Drainage, Flood routing, Legislation, Land management, Regulation, Management, Permits, Penalties(Legal).

The Montana legislature passed the Floodway Management and Regulation Act in order to prevent and alleviate flooding threats to life and health and to reduce private and public economic losses. The specific purpose of this Act is to guide development of floodway areas. The Department of Natural Resources and Conservation is authorized to initiate a comprehensive program for the delineation of designated floodplains and designated floodways for every watercourse and drainway in the state. After a thorough study and a public hearing, land-use regulations shall be established within designated political subdivisions. Each subdivision has six months after transmittal of floodplain information to adopt land-use regulations which meet or exceed the minimum standards established. It is unlawful for a person to establish an artifical obstruction or nonconforming use within a designated floodplain or floodway without a permit. Specific open space uses are excepted, including agricultural and industrial uses. The types of uses a permit will be issued for are specifically enumerated herein, along with application procedures. The Department is authorized to enter lands for inspection and reserves the right to judicial remedy for violations. (Thomas-Florida)
W78-08208

BRUSCO TOWBOAT CO. V. STRAUB (LEASING PROGRAM FOR STATE OWNED SUBMERGED AND SUBMERSIBLE LANDS EXAMINED).
567 P2d 1037-52 (Ore. Ct. App. 1977).

Descriptors: *Oregon, *Navigable waters, *Riparian rights, *Leases, Aquatic life, Marinas, Docks, Submergence, Buoys, Administrative decisions, Riparian waters, Riparian land, Access routes, Adjacent land owners, Beneficial use, Boundaries(Property), Public access, Public benefits, Public rights.

A program of the Oregon State Land Board requiring users to enter into leases for the use of submerged and submersible lands underlying navigable waterways is challenged in this consolidation

of three cases. The plaintiffs seek a declaratory judgment that the program is invalid in that it denies equal protection of the laws, violates the commerce and supremacy clauses to the Oregon and United States constitutions, and results in takings without just compensation. The program requires anyone engaged in permanent or long-term use of state-owned submersible lands, which effectively preclude any other use of and enjoyment of such land and the overlying water, to obtain a lease and pay rent to the state. Exempted from the lease program are uses which are essentially navigational or in aid of navigation. Construction of permanent facilities subject to the lease program requires a permit from the Corps of Engineers. The court held that the lease program is constitutional, compatible with the commerce and supremacy clauses, and not violative of equal protection. The court also allowed riparian owners who had constructed navigational structures prior to the program's effective date a reasonable period of rent free use of their structure. (Spector-Florida)
W78-08209

TALBOT'S INC. V. CESSNUN ENTERPRISES, INC. (GRANTING OF EASEMENT OF REASONABLE NECESSITY NOT SUPPORTED BY EVIDENCE).
566 P2d 1320-24 (Alas. 1977).

Descriptors: *Easements, *Navigable waters, *Adjacent land owners, *Alaska, Land use, Submergence, Cities, Acess routes, Legal review, Boundaries(Property), Claims(Contracts), Legislation, Judicial decisions, Tidal marshes, Prescriptive rights, Water law.

The Alaska Tidelands Statute gives municipalities the power to adjudicate easements by reasonable necessity upon application for a conveyance. Plaintiff property owner brought suit to establish such an easement over an adjacent land owners' tidelands parcel. The trial judge granted a permanent injunction against any interference with Plaintiffs' alleged easement rights. The defendants appealed from this injunction. The Supreme Court of Alaska struck down the trial court's order and clarified the interpretation of the Tideland's statute. The court held that before an easement can be found to be reasonably necessary there must be no other reasonable mode of enjoying the dominant tenement. The fact that the available mode of access was less convenient or was not the mode of access commonly used did not render it unreasonable. While strict or absolute necessity is not required, more than mere convenience must be demonstrated before a tidelands occupant is entitled to an easement under the Tidelands statute. The Supreme Court reversed the trial judge's finding that the alleged easement was reasonably necessary for use and enjoyment of the plaintiffs' property. (Spector-Florida)
W78-08210

SOUTH DAKOTA-MINNESOTA BOUNDARY WATERS.
Minn. Stat. sec 114.13 (1976).

Descriptors: *Minnesota, *South Dakota, *Interagency cooperation, *Interstate compacts, *Water levels, Administrative agencies, Interstate, Natural resources, Political aspects, Surveys, Water law, Water level fluctuation, Water policy, Water resources, Interstate rivers, Boundaries(Property), Legislation.

The Minnesota commissioner of natural resources shall cooperate with the director of the game and fish commission of South Dakota with regard to the South Dakota-Minnesota boundary water. The commissioner shall have the power and authority: to determine the most beneficial levels of artificially controlled boundary waters; to prescribe and promulgate rules to regulate investigations, surveys, and hearings; and to hold hearings and take evidence. Hearings shall be held at such time and place as may be designated by the commissioner. If the commissioner and the director fail to agree on matters which affect the interests of both state, an engineer knowledgeable on the issues will be chosen by the governors of both states as an arbitrator. Any party aggrieved by any order of the commissioner establishing or regulating water levels may appeal to the district court or the circuit court of any county in either state in which the subject matter of the order is located, or to the district court of the county in either state where the capital thereof is located. Appeals may be taken from the judgments of the district court to the supreme court of the respective state. (Jordan-Florida)
W78-08211

HAMPSON V. SUPERIOR COURT FOR COUNTY OF INYO.
139 Cal. Rptr., 722-31 (App. 1977).

Descriptors: *Administrative agencies, *Septic tanks, *Waste water(Pollution), *Remedies, California, Environment, Land use, Discharge(Water), Law enforcement, Public health, Sewage, State governments, Wastes, Water policy, Water pollution, Water quality control, Water law, Administrative decisions, Jurisdiction, Legislation.

The petitioner regional water quality control board sought to have the respondent Superior Court restrained from setting aside a decision of the board. The board's decision denied the plaintiff landowner's request for an exemption from a waste discharge prohibition adopted by the board. The board argued that the landowners had failed to exhaust administrative remedies and therfore the Superior Court did not have jurisdiction. The landowners contend that an agreement between themselves and the board's executive officer was a final administrative decision; that the officer acted in bad faith in presenting the agreement to the board for approval; and that this agreement acted as an estoppel against the board. The Court of Appeal issued a writ of prohibition restraining the Superior Court from overruling the board. The Court found that, although an executive office may be authorized to make an initial determination, ultimately the board is responsible for granting exemptions. Furthermore, estoppel could not be invoked against a governmental agency where it would operate to defeat the agency's purpose. Since the regional board's decision could have been appealed to the State board, the court held that the landowner's had not exhausted their administrative remedies. (Jordan-Florida)
W78-08212

SALT LAKE CITY CORP. V. UTAH WOOL PULLING CO. (VALUE OF WATER RIGHTS AS PART OF COMPENSATION TO BE PAID THROUGH CONDEMNATION PROCEEDINGS).
566 P.2d 1240-45 (Utah 1977).

Descriptors: *Condemnation, *Condemnation value, *Utah, *Eminent domain, *Market value, Aquifers, Compensation, Damages, Comparative costs, City planning, Claims(Contracts), Industrial water, Land appraisals, Legal review, Public rights, Replacement costs, Water rights, Judicial decisions, Value.

Condemnation proceedings initiated by the plaintiff city resulted in a pretrial settlement in which the value of the defendant's land, buildings and water diversion facilities used to remove underground water was ascertained. The defendant company then claimed additional compensation for the value of its water rights and sought to prove value by showing how the water rights were used, the cost of replacement of the water and by offering evidence of market value. The plaintiff city claimed the water rights had no or nominal value. This argument was based on the assertion that the value of the water rights was included in the payment for diversionary facilities. The Utah Supreme Court upheld a jury verdict for the defendant company in the amount of $50,000, stating the company was entitled to have its water rights valued in relation to the appurtendant property. The court also upheld the admission of evidence as to value to which the company put its water rights. Lastly, the court approved of the trial judge's admission of evidence of comparable sales outside the defendant's aquifer to measure value and to his giving of jury instructions on 'specialty property'. (Spector-Florida)
W78-08213

ENVIRONMENTAL AND ESTUARINE STUDIES.
Md. Code Ann. secs 3-401 thru 3-403 (1974), as amended, (Supp. 1976).

Descriptors: *Maryland, *Education, *Research facilities, *State governments, Legislation, Colleges, Training, Universitives, Chesapeake Bay, Ecology, Environment, Estuarine environment, Environmental effects, Environmental control, Research and development, Planning, Projects, Testing, Conservation, Natural resources.

The University of Maryland's Center for Environmental and Estuarine Studies is designated to encompass the functions of the National Resources Institute. The Center is under the control of Maryland's Board of Regents. Its purpose is to conduct a research and education predictive ecology program geared to the improvement and preservation of Maryland's physical environment. Functions shall include: (1) liaison with the state to identify environmental problems, particularly those affecting Chesapeake Bay; (2) inventory appropriate professional individuals, public and private organizations, facilities, and programs dealing with the environment; (3) prepare reports concerning topical environmental problems; (4) assist the development and coordination of environmental studies programs at public and private educational and research institute; (5) perform other acts of public service relating to the environment, and (6) apply the university's resources where needed by state agencies in environmental matters. The Center may collect animal, plant, or other sample, and use any collection device, necessary for its programs. (Malefatto-Florida)
W78-08214

CHESAPEAKE BAY AND TRIBUTARIES.
Md. Code Ann. sections 8-1601 through 8-1605 (1974), as amended (Supp. 1976).

Descriptors: *Maryland, *Legislation, *Chesapeake Bay, *Dredging, Conservation, Penalties(Legal), State governments, Harbors, Spoil banks, Tidal waters, Bottom sediments, Water pollution control, Channel improvement, Recreation, Fish conservation, Water law, Legal aspects.

The Chesapeake Bay and its tributaries, which are assets of the state, are threatened by the dumping of dredge spoil in Baltimore Harbor. This dumping pollutes the bottomland of the bay and its tributaries, is harmful to fish and other marine life, and affects recreational use to the recreational and social detriment of the people. Baltimore Harbor includes the tidal portions of the Patapsco River, and spoil is defined as earth, rock, waste, or anything else dredged from Baltimore Harbor. Dumping or scattering of spoil from Baltimore Harbor is prohibited in any portion of the water or bottomland of Chesapeake Bay or the tidewater portions of any of its tributaries outside of Baltimore Harbor. The attorney general or certain state's attorneys are empowered to seek an injunction against any person violating or threatening to violate this section, and may also seek criminal penalties against alleged violators. A violation is designated a misdemeanor calling for a maximum fine of $5000 or imprisonment of up to one year or both, for each violation. (Molloy-Florida)

W78-08215

WATER POLLUTION CONTROL AND ABATEMENT.
Md. Code Ann. sections 8-1401 through 8-1417 (1974) as amended (Suppl 1976).

Descriptors: *Maryland, *Legislation, *Water pollution control, *Planning, Pollutants, State governments, Legal review permits, Disposal, Government interrelations, Oil pollution, Storage tanks, Water supply development, Interstate compacts, Disasters, Penalties(Legal), Cost allocations, Pollution abatement.

The Department of Health and Mental Hygiene and Natural Resources are required to submit a joint annual report to the governor and assembly summarizing the state's water pollution control program. Included in the report are water supply plans, interstate compacts, studies developed under this subtitle, federal plans and other state studies. All oil terminal facilities must be licensed, with a fee based on the size of the storage facility. An oil disaster fund is created to plan for disasters and maintain equipment. Department orders are subject to direct judicial review. Any party discharging pollutants into the waters of the state must obtain an administrative permit after hearings and reports. In cooperation with appropriate agencies, the Department shall monitor the dumping of dredged spoil in the waters of the state. The Department shall also identify and establish criteria for the disposal of hazardous substances. A permit is required to operate a hazardous disposal facility, with fee based on the dangers and costs of the disposal process. Violation of these provisions is a criminal misdemeanor, and the violator may be enjoined. Oil discharge from a vessel may result in denial of port clearance, and penalties constitute a lien on the vessel. (Molloy-Florida)
W78-08216

FLOOD HAZARD MANAGEMENT ACT OF 1976.
Md. Code Ann. sections 8-9A01 through 8-9A11 (1974) as amended (Supp. 1976).

Descriptors: *Maryland, *Legislation, *Flood control, *Mapping, Watershed management, Local governments, Floodproofing, Flood plain, Zoning, Regulation, State governments, Maps, Hazards, Permits, Planning, Water management(Applied), Public health.

Flooding causes damage, public costs, and the need for statewide management of waters. The Department of Natural Resources shall prepare maps showing flood hazard areas, relying on historical information and other available data. The Department shall hold hearings in each county with a flood hazard area before adopting flood hazard maps. Every county shall then develop use rules for each flood hazard area. These rules shall take into account availability of alternate locations, permanency of the proposed use, effects on the adjacent area, tidal or nontidal character, and efficient agricultural production. Applicants for use must show provisions for adequate drainage, adequacy of water and sewer facilities, ability of structures to withstand a 100 year flood, and that the use will not worsen local flooding. The Department shall assume overall management by dividing the state into watersheds for flood control planning. Implementation of watershed plans is the responsibility of the counties, in consultation with the Department. Management techniques may include: (1) flood control dams; (2) levees and dikes; (3) floodways; (4) retention structures; (5) flood warning systems; (6) public acquisition; (7) floodproofing; and (8) drain and stream maintenance. Each county may implement civil penalties to insure compliance with the provisions of this statute. (Molloy-Florida)
W78-08217

FLOOD CONTROL AND WATER SUPPLY POWERS AND FUNCTIONS.
Md. Code Ann. sec 8-905 (1974), as amended, (Supp. 1976).

Descriptors: *Maryland, *Flood control, *Flood data, *Storm water, *Drainage water, Surface runoff, Flooding, Floodwater, Surface waters, Hazards, Surface drainage, Storm runoff, Watersheds, Structures, Legislation, Drainage effects, State governments, Water management(Applied), Feasibility, Downstream.

The Maryland Department of Natural Resources shall conduct a study of all state planned or financed construction projects to determine if the project will create a surface water runoff which may cause or add to on-site or downstream flooding hazards. Considered in the study will be natural conditions, existing storm drainage, future development in the watershed and flood control structures. If such an additional flood hazard will be created by the project studied, the Department of Natural Resources shall require storm water management or retention measures to be included in the project. (Easterbrook-Florida)
W78-08218

HOEKSTRA V. KANKAKEE (DIMINISHMENT OF PROPERTY VALUES BY COUNTY HIGHWAY IMPROVEMENTS).
365 N.E. 2d 553-556 (Ill. App. Ct. 1977).

Descriptors: *Illinois, *Eminent domain, *Flood damage, *Road construction, Culverts, Economics, Farms, Highways, Local governments, Floods, Overflow, Property values, Right-of-way, Road design, Water law, Damages, Judicial decisions, Leases, Drainages.

Plaintiffs filed suit against defendant County to recover damages for the loss of a corn crop due to flooding which allegedly resulted from an improperly constructed highway culvert. Plaintiffs alleged that the culvert was constructed in a manner which prevented the water from draining naturally. Plaintiffs also alleged that the actions of the county constituted a taking of property rights for public use without just compensation. The trial court dismissed the complaint on the bases of defendant's governmental immunity. The appellate court affirmed the dismissal, but held that since the culvert was constructed before the plaintiffs leased the property, they were deemed to have known how the culvert would affect the premises and to have assumed the risk of flooding. The court held that although a county is liable for damages to private property caused by a public improvement, any resulting action for damages must be brought by the owner of the property at the time the improvement is constructed. Subsequent leases take the property as it existed at the time of the leasing, because the value of the land was already diminished and the risk of flooding was reflected in the low rent. (Jordan-Florida)
W78-08219

COUNTY OF INYO V. CITY OF LOS ANGELES (GROUNDWATER MANAGEMENT BASED ON HYDROLOGIC CYCLE AND PROJECTED LONG-TERM USE).
132 Cal. Rptr. 167-74 (Cal. App. 1976).

Descriptors: *Hydrologic cycle, *California, *Pumping, *Groundwater basins, Water utilization, Water consumption, Groundwater, Subsurface waters, Judicial decisions, Hydrologic data, Water resources, Water policy, Water allocation(Policy), Water management(Applied), Precipitable water, Environmental effects.

The defendant city sought to increase its extraction of subsurface water from the Owens Valley Basin. Holding that the proposed increase was a 'project' within the meaning of the California Environmental Quality Act (CEQA), the defendant was ordered to prepare an environmental impact report and to complete the CEQA requirements. Pending ultimate resolutions of the suit, it became necessary to establish an interim rate of groundwater extraction. Because this computation required an evidential inquiry, the matter was referred to a lower court. The lower court acting on formulas devised by appellate court twice fixed a pumping rate. This action is an appeal taken by the plaintiff county to the second interim rate. The appellate court, in vacating the lower court's finding, sought to formulate an equitably convenued pumping rate as well as delineate an appropriate time span to which the rate should be applied. Based on the defendant's long-range projected pumping rate and evidence of available precipitation, the court set an interim limit of 149.56 cfs. In fixing a time span the court looked to nature's cycle and shifted the beginning of the hydrological year to April 1. (Petruff-Florida)
W78-08220

PACK V. CORPS OF ENGINEERS UNITED STATES ARMY (CORPS RIGHT TO DREDGE AND FILL).
428 F. Supp. 460-68 (M.D. Fla. 1977).

Descriptors: *Florida, *Shrimp, *Beach erosion, *Dredging, Commmercial shellfishing, Aquatic environment, Shore protection, Rivers and Harbors Act, Legislation, Environmental effects, Shores, Aquatic animals, Economic impact, Landfills, Erosion control, Marine animals, Conservation.

Plaintiff commercial shrimpers brought an action to enjoin the defendant United States Army Corps of Engineers from performing proposed dredge and fill activities designed to prevent the erosion of certain Florida beaches. The project was authorized by Congress under section 301 of the Rivers and Harbors Act. The defendant moved the proposed borrow site in response to plaintiff's request that fill not be taken from prime shrimping areas but communications broke down when plaintiffs also complained of the manner in which fill was to be placed on the beaches. Plaintiffs contended that the Environmental Impact Statement for the project was deficient because it failed to consider possible adverse environmental effects on shrimp and other marine life in the affected area. Plaintiffs also alleged that the EIS failed to give adequate consideration to alternatives. The District Court, applying the reasonableness standard of review, held that the EIS compiled with the requirements of the National Environmental Policy Act by adequately setting forth the problems and the effects of the proposed activity on the marine environment. The court denied the preliminary injunction, holding that plaintiffs had standing but failed to show irreparable harm. (Beamer-Florida)
W78-08221

CALIFORNIA DROUGHT OF 1976 AND 1977: EXTENT, DAMAGE, AND GOVERNMENTAL RESPONSE.
Comptroller General of the United States, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 574, Price codes: A06 in paper copy, A01 in microfiche. October 19, 1977. 92 p, 14 fig, 2 append.

Descriptors: *Droughts, *California, *Environmental effects, *Agriculture, *Water conservation, *Legislation, *Water supply, Planning, Hydroelectric power, Power, *Water planning, Governmental response.

Data on the extent and impact of and governmental response to the California drought of 1976 and 1977 are presented. In 1977, California agriculture (especially livestock) was expected to lose $2.4 billion in gross farm income and related industries. Losses in 1976 were estimated at $500 million, but losses to urban and industrial areas were con-

sidered minimal. During 1977, farmers switched to crops requiring less water, pumped groundwater extensively, and took advantage of rising crop prices. The impact on employment, recreation, and electric power generation generally was not large. Hydroelectric power, which normally furnished about 28% of State needs, was cut back by about one-third as a result of low reservoir levels; power-generating alternatives are assessed. Specific state, federal, and local government actions included (1) legislation to help improve water supply systems, purchase and transport water, provide immediate drought relief, and promote water conservation, (2) funding for drought-related emergencies, (3) establishment of a task force to deal with the immediate and long-range implications and to coordinate state, federal, local, and private relief efforts, (4) local and regional emphasis on water conservation, including mandatory and voluntary water conservation measures and (5) reduction by about 60-75% of the amount of water delivered for agriculture by the two major water projects (which provide about 25% of State needs). Water planning and development techniques are described. (Seip-IPA)
W78-08225

STATE WATER CONSERVATION PROJECTS.
Montana Dept. of Natural Resources and Conservation, Helena. Engineering Bureau.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 546, Price codes: A05 in paper copy, A01 in microfiche. Report, March, 1977. 187 p, 24 fig, 8 tab, 1 append.

Descriptors: *Montana, *Water conservation, *Projects, *Research and development, *Economics, Inspection evaluation.

The current physical and financial condition of the 41 water conservation projects intitiated by the Montana Water Resources Board (MWRB) and the nature of the involvement of Department of Natural Resources and Conservation in their operation are described. Also reported are: the annual inspection program conducted by the Department, major problems encountered on the projects, information to be included in project critiques, and implementation progress. (Twenty-two of the 41 project reports are presented.) The appendix includes a master list of projects, water rights summary, and a selected bibliography. (Seip-IPA)
W78-08235

THE USE OF GEOMETRIC PROGRAMMING IN THE DESIGN OF AN ALGERIAN WATER CONVEYANCE SYSTEM,
Becht Corp., San Francisco, CA.
For primary bibliographic entry see Field 4A.
W78-08308

A REVIEW OF LOCAL AGENCIES IMPACTING REGIONAL WATER QUALITY MANAGEMENT.
Miami Valley Regional Planning Commission, Dayton, OH.
For primary bibliographic entry see Field 5G.
W78-08315

EVALUATION OF THE COLORADO WATER SUPPLY PROGRAM.
Environmental Protection Agency, Denver, CO. Water Supply Section.
For primary bibliographic entry see Field 5G.
W78-08316

ACCOMPLISHMENT PLAN. REGION VIII. JORDAN RIVER BASIN--SALT LAKE CITY AREA.
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 5G.
W78-08317

EVALUATION OF EFFLUENT REGULATIONS OF THE STATE OF ILLINOIS.
Illinois Inst. for Environmental Quality, Chicago.
For primary bibliographic entry see Field 5G.
W78-08319

MANPOWER PLANNING CRITERIA MANUAL FOR STATE WATER POLLUTION CONTROL AGENCIES.
Abt Associates, Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-08320

ASSESSING IMPACTS OF NEW OCEAN LAW,
Washington Univ., Seattle.
E. Wenk, Jr.
Woods Hole Oceanographic Institution, Woods Hole, Massachusetts, Report WHOI-76-104, November, 1976. 32 p.

Descriptors: *Law of the sea, *Oceans, *International law, *Political constraints, *United Nations, Legal aspects, Technology, Political aspects, Environmental control, Natural resources, Water law, International waters, Treaties, Management, Governments, Waste disposal, Jurisdiction, Boundaries(Surfaces), Population, Food abundance, Energy, Minerals.

Use of the sea for transportation, food, energy, minerals, waste disposal, and recreation is growing so dramatically that the United Nations' Conferences on the Law of the Sea (LOS) have attempted over the past three years to focus on worldwide cooperation to ensure that the deep seas and ocean bottoms will regain the legacy of all human beings. However, initial dedication to global unity has died and nationalism has become paramount as developing nations act out their feelings over historic deprivation. This article's author is fearful that the LOS will fail in its goal of structuring the future of international ocean affairs. Recommendations to effectuate rational management of the oceans include: (1) heroic acts of leadership; (2) anticipating rather than reaccting to crises; (3) use of anticipatory technological assessments; and (4) looking toward a process which is less a game of political power and more one of healthy steering of a 'sociopolitico-technological engine'. Finally, a moratorium on unilateral initiatives will allow planning tools such as technology assessment to be used to identify alternative courses of action and shown United Nations members what the expected results of each course would be. This will hopefully instigate a renewed spirit of cooperation. (Spector-Florida)
W78-08321

HOW THE DRINKING WATER ACT AFFECTS INDUSTRIAL PLANTS,
Allied Chemical Corp., Morristown, NJ. Specialty Chemical Div.
For primary bibliographic entry see Field 5G.
W78-08322

SUBMARINE AREAS AROUND GREAT BRITAIN,
Durham Univ. (England). School of Law.
F. E. Dowrick.
Public Law, p 10-28, Spring 1977.

Descriptors: *Ownership of beds, *Boundaries(Property), *Public rights, *Public lands, *International law, High water mark, Seashores, Intertidal areas, Coasts, Regions, Tidal streams, Tidal marshes, Continental shelf, Estuaries, Bays, Law of the sea, Water law, Exploration.

As the feasibility of extracting wealth from the sea-bed and sea-water becomes economically practical, the question of ownership of areas adjacent to coastlines will arise. This article describes a land survey, confined to Great Britain, which extends seaward from the mean high water mark. The survey works outward starting with the foreshow of the coast and tidal rivers, taking account of the beds of tidal rivers, estuaries and bays, the sea bed under territorial waters, the continental shelf and then out to and including the projected exclusive economic zone. This article defines the legal limis of each of the above areas and then considers the question of who, under English and Scots law is invested with title and what is the degree of ownership. Each section of the article deals with a specific area and culminates in an estimate of the area in terms of square statutory miles. By defining Great Britain as including the land under its internal and territorial waters the proportion of publicly owned land rises drastically. The author suggests that statutes will soon be needed to reconcile the emerging and existing interests in the sub-marine parts of the public domain. (Curran-Florida)
W78-08323

INTERNATIONAL UNITISATION OF AN OFFSHORE GAS FIELD,
Leicester Univ. (England). School of Law.
J. C. Woodliffe.
International and Comparative Law Quarterly, Vol 26, No 2, p 338-53, April 1977.

Descriptors: *International law, *Treaties, *Continental shelf, *Natural gas, Legal aspects, Law of the sea, Foreign waters, International waters, International commissions, Foreign countries, Europe, Oceans, Water law, Natural resources, Water resources, Water resources development, Jurisdiction, Political aspects, Governments.

In 1972 it was discovered that the Frigg gas field in the North Sea extended from the British sector into the Norwegian sector. The discovery activated a treaty procedure agreed upon earlier by the two nations. As a result of negotiations, the first international treaty governing a shared offshore gas field is currently in use. Though the field will be exploited as a single unit, the Frigg Agreement does not apportion the gas on an equal basis. Instead, the reserves will be apportioned by determining the amount of gas in the British and Norwegian sectors of the continental shelf. Provisions regarding exploitation of the gas field include regulations governing the licensees of the two nations. Since the government of Norway has decided to sell its gas to Britain, two undersea pipelines, one British and one Norwegian, will carry gas to Scotland. The Norwegian pipeline will be under concurrent jurisdiction of the two nations. Other treaty provisions include the number of installations, settlement of disputes, emergency action, prevention of pollution, and protection of workers. The Frigg Agreement will probably be a model for future treaties involving offshore resources development between two or more nations. (Malefatto-Florida)
W78-08324

SUSPENDED SOLIDS LIMITATIONS FOR WASTEWATER TREATMENT PONDS.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08325

NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM, GENERAL PERMIT PROGRAM (PROPOSED RULES).
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08326

AN ENVIRONMENTAL OVERVIEW OF GEOTHERMAL RESOURCES DEVELOPMENT,
Indiana Univ. at Bloomington. School of Law.
For primary bibliographic entry see Field 5G.

W78-08327

RECENT DEVELOPMENTS IN THE REGULATION OF OCS OIL AND GAS ACTIVITY,
Liskow and Lewis, New Orleans, LA.
For primary bibliographic entry see Field 5G.
W78-08328

LAW OF THE SEA: CONFERENCE AND PROBLEMS OF IMPLEMENTATION.
Proceedings, Law of the Sea Institute Tenth Annual Conference, June 22-25, 1976, University of Rhode Island, Kingston, Rhode Island. 415 p, 5 fig, 19 tab.

Descriptors: *Law of the sea, *International waters, *Environmental control, *International law, *Negotiations, Coasts, International commissions, United Nations, Oceanography, Management, Mining, Boundary disputes, North America, Water law, Legal aspects, Oceans, Economics.

Included in this record of the proceedings of the Tenth Annual Conference of the Law of Sea Institute are commentaries, discussions, and speeches by participants of the conference. These commentaries, discussions, and speeches are categorized into four major areas. Articles relative to the topic of international aspects of economic zone management living resources concern the fisheries policy of the European community, national and international aspects of coastal zone management, vessel traffic management, and the extent to which marine transportation within the zone will be effected by enforcement of proposed pollution controls. Part II deals with modes of establishing exclusive economic zones. This section contains chapters on unilateralism, delimitation, boundaries of the zone, and methods for dispute settlement. Part III includes discussions of environmental provisions in the revised single negotiating text. Implementation of the scientific provisions of the text as well as the present status of the marine science negotiations are also discussed. The topic 'exploitation of the deep seabed' contains commentaries on the environmental consequences of deep-sea mining, U. S. policies and the ocean mining industry, and an evaluation of the seabed revised single text. (Howard-Florida)
W78-08329

PREEMPTION AND THE ROLE OF STATE LEGISLATION IN THE COASTAL ZONE,
McCutchen, Black, Verleger and Shea, Los Angeles, CA.
R. K. Wrede.
Natural Resources Lawyer, Vol. 10, No. 2, p 237-48 (1977).

Descriptors: *Coasts, *Federal-state water rights conflicts, *Supervisory control(Power), *Land management, Shores, Federal jurisdiction, State jurisdiction, Legal aspects, Federal government, Water law, Water rights, Legislation, Management, Regulation, Coastal structures.

According to the doctrine of federal preemption, in any case where there is a discernible conflict between federal law and state action, federal law prevails. Congress may implicitly or explicitly reserve to the states any or all the powers which may be affected by a particular piece of federal legislation. The issue of coastal zone management involves such a saving clause. This presents the question of how much leeway Congress has left the states in the management of their coastal zones by virtue of this clause. It does not appear that the Coastal Zone Management Act has done much to alter the balance of power between state and federal government with regard to coastal zone management. It is not clear exercise of federal preemption, yet it does cede ultimate power to the states. Rather, the Act is intended primarily to provide federal supervision and encouragement. Thus, it seems that the states retain broad discretion to exercise their resource management rights, subject to federal power to intervene in federal or constitutional policy matters. (Rule-Florida)
W78-08330

FLORIDA KEYS COASTAL ZONE MANAGEMENT STUDY.
Florida Dept. of Natural Resources, Tallahassee. Coastal Coordinating Council.
For primary bibliographic entry see Field 6B.
W78-08331

COASTAL ZONE MANAGEMENT,
E. Mullin.
Environment, Vol. 19, No. 8, p 2-3 (November, 1977).

Descriptors: *Coastal engineering, *Coastal plains, *Land management, *Coasts, Legislation, Grants, Water utilization, Erosion, State governments, Atlantic Coastal Plain, Pacific Coast Region, Gulf Coastal Plain, Great Lakes Region, Loca governments, Land use, Zoning, Beach erosion, Beaches, Public access.

Under the Federal Coastal Zone Management Act of 1972, federal aid is provided to coastal states and territories to develop programs to protect the nation's coastal resources. To qualify under the act, a state management plan must: (1) idenify its coastal boundaries; (2) define permissible land and water uses in the coastal zone; (3) designate areas of particular concern; (4) establish adequate legal authorities to ensure effective implementation; (5) establish guidelines for priority uses in different areas; (6) idenify the responsibilities of local, regional, state, and interstate agencies in the complementation of the program; and (7) provide for beach access and erosion and and energy facility siting. To date, only a few areas have received approval for program implementation. The article examines several weaknesses in many state programs. For example, vagueness of policy often prevents strong program implementation. In addition, many states rely on existing use patterns rather than natural resource characteristics to identify permissible uses. Finally, many states lack sufficient legal authorities for implementation, and some rely on local controls. (Quarles-Florida)
W78-08333

THE WINTERS DOCTRINE AS FEDERAL COMMON LAW,
Martineau and Maak, Salt Lake City, UT.
R. J. Grow, and M. N. Stewart.
NAtural Resources Lawyer, Vol. 10, No. 3, p 457-97, 1977.

Descriptors: *Federal-state water rights conflicts, *Reservation doctrine, *Water rights, *Water allocation(Policy), *Common law, Water law, Public lands, Jurisdiction, Water utilization, State governments, Supervisory control(Power), Legislation, Prior appropriation, Legal aspects, Withdrawn lands, Regulation, Federal government, *Winter Doctrine.

Early federal legislation affecting water rights allocated the ownership of water rights as well as the authority to control such rights between the states and the fedral government. However, there are alternative constructions of these acts which spark debate on the proper balance of federal and state ownership. These alternate constructions affect the viability of the Winters doctrine. The doctrine states that where the federal sovereign has expressly withdrawn or reserved lands from the public domain for purposes requireing the use of water, sufficient water is implied reserved to guarantee the present and future fulfillment of those purposes. The federal reserved water rights are junior to those vesting under state law prior to certain of the federal reservation, and senior to all non-federal rights vesting afterwards. Although the Winters doctrine has never been treated by federal courts as federal common law, analysis of the docrine as federal common law will lead to better evaluation of the substantive worth of the doctrine and more accurate prediction of its future development. (Rule-Florida)
W78-08334

THE INDIANA EXPERIMENT,
For primary bibliographic entry see Field 5G.
W78-08335

ZERO DISCHARGE INTO WATERS BY 1985, NO WAY,
For primary bibliographic entry see Field 5G.
W78-08336

COASTAL ZONE LAW AND POLICY,
Washington Univ., Seattle. School of Law.
R. W. Johnson, and R. J. Goldsmith.
1977. 502 p.

Descriptors: *Coastal plains, *Common law, *Legislation, *State governments, *Federal Water Pollution Control Act, Boundaries(Property), Water management(Applied), Coasts, Ecosystems, Fisheries, Management, Jurisdiction, Control systems, Federal government, Interfaces, Treaties, Land use, Eminent domain, Regulation, International law.

This casebook of leading federal and state cases, statutes, and regulations regarding coastal zone management is designed for use in law school courses and may be helpful to lawyers and officials working in the area. Excerpted articles in initial chapters provide an overview of politics of the ocean, the National Coastal Zone Management Act of 1972, natural resources in the zone, and man's activities there. Problems of jurisdiction, ownership and control are examined through case law and articles on land use planning, eminent domain, and the taking issue. Potential jurisdictional conflicts are discussed with regard to international treaties, federal-state relationships, and fisheries. One chapter is entirely devoted to federal controls affecting the zone. This chapter places particular emphasis on the Federal Water Pollution Control Acts and Amendments. State common law development of private rights as well as the public trust doctrine, navigational servitude, express and implied dedication and other public rights, is outlined. The concluding chapter surveys state coastal zone management programs, discussing the programs of California, Delaware, Oregon, Florida, Massachusetts and Washington in detail. (Howard-Florida)
W78-08338

SOUTH DAKOTA'S RESPONSE TO THE 'WATER CRISIS': AN ANALYSIS OF ALTERNATIVES,
R. E. Hayes.
South Dakota Law Review, Vol. 22, No. 2, p 272-96 (Spring 1977).

Descriptors: *South Dakota, *Water rights, *Legislation, *Riparian rights, *Prior appropriation, *Appropriation, Semi-arid climates, Water management(Applied), Reasonable use, Beneficial use, Eminent domain, Irrigation, Groundwater resources, Judicial decisions, Surface waters, Flow, Usufructuary right, Compensation.

The dual system of water rights previously operational in South Dakota, the inherent conflicts between the riparian and appropriative systems, and recent legislative and court attempts purporting to resolve those conflicts are discussed. The riparian system, which vested in every proprietor on the bank of a stream, the right to use water for all reasonable purposes is shown to be problematic because of the state's semi-arid climate. The ap-

propriative systems, permitting water to be diverted from a stream, thus promoting the most efficient use of scarce water resources, is depicted as more desirable. The state attempted to resolve these conflicts in 1955 by effectively declaring all water in the state to be the property of the people. By basing its action on the state's police powers instead of eminent domain, the legislature effectively took or significantly restricted recognized quasi-property rights without compensation. This legislation has since been upheld by state courts as a reasonable exercise of police power. However, the police power justification of this legislation is viewed as potentially dangerous and disruptive should it be expanded from the limited area of water rights to other forms of privte property. (Easterbrook-Florida)
W78-08339

RIPARIAN RIGHTS: THE LAW RETURNS TO ITS FORMER COURSE,
P. D. Cordes, Jr.
Loyola Law Review, Vol. 23, No. 2, p 563-70, Spring, 1977.

Descriptors: *Riparian rights, *Riparian land, *Navigable waters, *Constitutional law, *Boundaries(Property), Legal aspects, State governments, Beds, Beds under water, Grants, Common law, Decision making, Judicial decisions, Boundary disputes, Federal jurisdiction, Federal-state water rights conflicts, Federal government, Riparian waters, State jurisdiction.

The United States Supreme Court has often been asked to decide whether federal or state law is applicable when a navigable waterway alters the contour of a prestatehood federal land grant. This article outlines the common law of riparian rights under such circumstances and traces the Court's recent decisions. Prior to formation of the Union, territories and navigable waters were under 'state' sovereignty. After formation of the Union, but prior to a particular state's statehood, such territories and waters were under federal sovereignty. Upon statehood, ownership of the beds of navigable waterways became vested in the states. Consequently, when a navigable waterway changes its course, the sovereign powers of the state mandates that state law determine the rights of the riparian land owners, including those whose title originated by federal grant. Although Supreme Court decisions have strayed from the principle of state law determination, recently the Court has returned to that theory. The Court has reaffirmed that property ownership is governed by state law rather than general federal law. The author submits that the ability of a state to choose its system of determining riparian borders achieves proper equality among the states. (Spector-Florida)
W78-08340

FREEDOM OF NAVIGATION: THE EMERGING INTERNATIONAL REGIME,
Santa Clara Univ., CA. School of Law.
D. Shelton, and G. Rose.
Santa Clara Law Review, Vol. 17, No. 3, p 523-58, Summer 1977.

Descriptors: *Law of the Sea, *United Nations, *International waters, *International law, *Jurisdiction, Navigation, Resources, Exploitation, Continental shelf, Fishing, Conservation, Competition, Boundary disputes, Coasts, International commissions, Water law, Oceans, Regime, Legal aspects.

The third United Nations Law of the Sea Conference has been working since 1973 to resolve conflicts between maritime states seeking unhampered navigation and access to resources and coastal states seeking exclusive control of adjacent seas. As competition for ocean space and resources intensifies, new legal concepts must be developed to help balance these competing interests. This article examines Part II of the Revised Single Negotiating Text (RSNT) which contains basic compromises between the competing interests of maritime and coastal states. Also examined are the jurisdictional zones the RSNT creates, the rights and duties incident to those zones, the history of the Law of the Sea Conference, and the basic purpose and structure of the RSNT. In addition, the allocation of these rights and duties is examined to determine their impact on existing navigational rights. While Part II of the RSNT may shift the balance in favor of the interests of the coastal states, it contains the basic ingredients necessary to assure navigational freedom as required by maritime states. (Spector-Florida)
W78-08341

WETLANDS CONTROVERSY: A COASTAL CONCERN WASHES INLAND,
K. R. Martin.
Notre Dame Lawyer, Vol. 52, No. 5, p 1015-34, June 1977.

Descriptors: *Wetlands, *Regulation, *Inland waterways, *Natural resources, Control, Boundaries(Property), Compensation, Supervisory control(Power), Future planning(Projected), Legislation, State governments, Judicial decisions, Constitutional law, Jurisdiction, Public rights, Water management(Applied), Economic efficiency, Marshes, Eminent domain, High water mark.

Legislative recognition of the importance of coastal wetlands and the developing judicial concern that such recognition may affect constitutional safeguards against government appropriation of private property are discussed in this article. These legislative and judicial developments may provide sufficient indicia of the probable success interior states will have in formulating wetlands regulatory statutes. The enactment of effective legislation for the inland states involves questions concerning who should control the interior wetlands and how this control can be economically and constitutionally manifested. The author advocates state control over wetlands through legislation seeking to establish uniform criteria for state wide application. In discussing the scope and legal sufficiency of a statutory definition which would accurately describe and inventory the wetlands, approaches adopted by different states and the problems these inventory methods pose are analyzed. Included is an examination of the criteria considered in determining the mean high water line. Also discussed is the lawful extent of the police power in regulations adopted by the state to control use of the wetlands. The problem of enacting legislation which will withstand constitutional attack is also considered in this article. (Howard-Florida)
W78-08342

LEGISLATIVE AND JUDICIAL ATTENTION TO STREAM MODIFICATION: CHANNELIZATION, ITS EFFECTS AND ALTERNATIVES,
Syracuse Univ., NY. School of Law.
M. Migliore.
Cumberland Law Review, Vol. 8, No. 1, p 21-75, (Spring, 1977).

Descriptors: *Flood control, *Governments, *Planning, *Stream improvement, Channel improvement, Channel morphology, Erosion control, Flood protection, Hydraulic structures, Legal aspects, Legislation, Meanders, Regulation, River training, Social aspects, Streambeds, Stream stabilization, Water law.

Channelization is the straightening, deepening, widening, clearing, or lining of an existing stream or the dredging of a new channel to which a stream is diverted. The primary purpose of channelization projects is flood control. The modern flood control techniques as utilized by the Army Corps of Engineers, Soil Conservation Service and private drainage districts have a drastic effect on the environment and have recently become the focus of considerable concern. The National Environment Protection Acts requirements have brought channelization to the attention of the courts. But, a reading of judicial opinions commenting on the inadequacies of the environmental impact statements submitted by participating agencies reads like a litany of administrative incompetence, myopic anti-environmental bias and lack of candor. A full disclosure statement required by NEPA must contain a full and objective discussion of the alternatives to any proposed channelization project. The alternatives to channelization are: (1) structural alternatives such as levees, floodways and reservoirs, (2) strict building and housing codes, (3) flood plain zoning, (4) flood proofing structures, and (5) flood risk insurance. (Jordan-Florida)
W78-08343

PROBLEMS OF LEGAL SECURITY OF THE WORLD HARD MINERALS INDUSTRY IN THE INTERNATIONAL OCEAN,
Deepsea Ventures, Inc., Miami, FL.
R. J. Greenwald.
Natural Resources Lawyer, Vol. 4, No. 3, p 639-45, (1971).

Descriptors: *Mineral industry, *Continental margins, *International law, *United Nations, *Jurisdiction, Oceans, Reasonable use, Negotiations, Investment, Claim(Contracts), Political aspects, Legislation, Public lands, Exploration, Dredging, Regime, Exploitation, Management, United Nations, Legal aspects, Technology, Mineralogy, Mining.

As populations and expectations grow, the world hard minerals industry endeavors to provide the world with enough useable minerals to supply developed countries while helping developing countries meet their goals of accelerating progress. The industry must increase supply as well as decrease the costs of minerals. Its efforts are hampered by the interplay of political pressures, inadequacy of existing international legal theory and practice, and the introduction of revolutionary legal theory by Third World nations. Specifically cited in this article are United Nations actions which have promoted effective restraint or prohibition of ocean mining by nations capable of exploiting the mineral resources beyond their continental margins and the lack of Administration efforts to implement President Nixon's call for an interim regime to encourage exploration and exploitation. Ocean miners need to be secure in their rights to exclusive use and title to goods recovered. The author suggests as an interim plan a system of national licensing of mine sites under which exclusive rights to sites would be enforced beyond the continental margins against other nationals of the licensing nation only. Under this system, duties could be established which would take into account the reasonable interests of all nations. (Spector-Florida)
W78-08344

THE FUTURE OF OUR CONTINENTAL SHELF AND THE SEABEDS,
Senate, Washington, DC.
T. Stevens.
Natural Resources Lawyer, Vol 4, No 3, p 646-53, 1971.

Descriptors: *Continental Shelf, *Continental margins, *United States, *Natural resources, *International law, Constitutional law, International waters, Jurisdiction, Offshore platforms, Investment, Treaties, Leases, Navigation, Fishing, Research and development, Exploration, Exploitation, Technology, Administration.

For the past two years, a Senate subcommittee has been studying the question of sovereignty and control over the continental shelf and seabeds. This subcommittee differed with the Administration's

suggestion that the United States renounce its sovereign rights to the continental margin in return for limited rights in a trustee-ship zone. It also rejected the suggestion that leases to areas of the continental shelf beyond the 200-meter isobath be issued by an international regime. The article not only summarizes the subcommittee's objections to the Administration's proposal but also emphasizes its support of the well established freedom of the seas doctrine. This doctrine guarantees international freedom of navigation, overflight, fishing, and cable and pipeline placement. It also implies freedom to research and explit high seas resources although this freedom has been tempered to declare that all coastal nations own the mineral estate of their continental margins. Claiming that the sovereign right of each coastal nation to exploit the natural resources of its continental shelf is not dependent on the acquiescence of any other nation, the sub-committee seeks affirmance of and adherence to existing international law rather than support of the Administration's policy favoring trusteeship. (Spector-Florida)
W78-08345

RIGHTS OF COASTAL NATIONS TO CONTINENTAL MARGINS,
Ad Hoc Committee on Mineral Resources Beneath the Sea, Washington, D.C.
L. W. Finlay.
Natural Resources Lawyer, Vol 4, No 3, p. 668-75, 1971.

Descriptors: *Treaties, *International law, *Regime, *United Nations, *United States, Exploration, Exploitation, Jurisdiction, International waters, Leases, Legal aspects, Continental margins, Continental shelf, Pollutants, Coasts, Oceans, Investment, Islands, Military aspects, Beds under water.

Pursuant to a 1970 Presidential statement expressing a desire to provide for exploration and exploitation in progressively deeper waters of the sea, the United States presented a draft treaty on trusteeship of the international seabed area to the United Nations. Its provisions give coastal nations substantial but limited rights as trustees for the international community with respect to that portion of their continental margins beyond a depth of 200 meters. This article examines that draft and suggests revisions. The author contends that land-locked and shelf-locked nations would benefit too greatly at the expense of coastal nations, and the proposed mass of detailed controls by the international regime would deter rather than promote exploration and exploitation. Also criticized are provisions which: (1) grant all residual powers to the international regime; (2) provide for suspension of a nation's trustee rights as a penalty for nonconformance; (3) strip signatories of the right to prevent erection of man-made islands on their continental margins; and (4) prohibit all military uses of the seabed beyond the 200-meter isobath. It is suggested that the drafters take a fresh look at the President's objectives and redraft the treaty in a manner which will eliminate the problems forecast in this article. (Spector-Florida)
W78-08346

UNITED NATIONS WATER CONFERENCE ADOPTS PLAN OF ACTION IN ARGENTINA.
U.N. Chronicle, Vol 14, No 4, p 35-39, April 1977.

Descriptors: *United Nations, *Foreign waters, *Foreign countries, *Federal jurisdiction, Water law, Public rights, Public health, Irrigation programs, Irrigation efficiency, Irrigation, Industrial water, Public benefits, Industrial wastes, Floods, Flood forecasting, Flood data, Flood control, Fish farming, Erosion control, Economics, Potable water.

Ensuring adequate water supplies for the earth's expanding population and its growing economic activities is a crucial world. The United Nations Water Conference has adopted a special action plan on community water supply and waste disposal. This plan calls for commitments from national governments to provide all people with water of safe quality and adequate quantity as well as basic sanitary facilities by 1990. In addition, action plan dealing with agricultural water use was adopted. Under this plan agricultural land will be protected from flooding and waterlogging. Through supervision and control of water distribution and use, irrigation and rainfed agricultural will be improved and extended. The Conference has recommended that countries provide economic incentives for recycling industrial waste water. Also recommended are national regulations prohibiting the discharge of untreated wastes from ships. Other recommendations involve flood forecasting and warning systems. Special attention is given to international and regional cooperation, particularly where countries share a common water supply. In these instances, the Conference recommends the establishment of joint committees to manage such areas. (Wright-Florida)
W78-08347

AN OFFER TOO GOOD TO REFUSE,
Department of the Interior, Washington, DC.
N. P. Reed.
Parks and Recreation, Vol 12, No 2, 15a-17a, February 1977.

Descriptors: *Water quality standards, *Conservation, *Recreation, *Land use, *Federal Water Pollution Control Act, Landfills, Zoning, Management, Reclamation, Environmental effects, Planning, Discharge(Water), Permits, Sewage treatment, Fish, National parks, Recreation, Dredging, Wildlife.

The Federal Water Pollution Control Act Amendments of 1972 require that we act as custodians of our nation's waters, restoring them to their intended role in nature after we have used them for man's benefit. They set standards for clean water; require permits for discharge from point sources, subject dredge and fill operation to review and permitting; call for regional, state, and local planning systems to achieve water quality standards; and provide federal funding for the construction of sewage treatment plants. This article illuminates the benefits that can be obtained from imaginative implementation of the amendments. It also discusses how the amendments can be used to further the objectives of the Bureau of Outdoor Recreation, the Fish and Wildlife Service and the National Park Service. Examples are given of how each department can use specific provisions to protect natural resources, encourage recreation programs, and benefit fish and wildlife. A close examination of programs being pursued by these three departments under the act show that progress has been made; but that work still needs to be done so that the unlimited benefits that can be provided under the amendments are achieved. (Spector-Florida)
W78-08348

AN OPEN TAP FOR TAYLOR SLOUGH,
National Park Service, Washington, DC. Resource Management Div.
L. P. Purkerson, and D. Morrow.
Parks and Recreation, Vol 12, No 2, p. 31a-34a, February 1977.

Descriptors: *Florida, *National parks, *Federal Water Pollution Control Act, *Swamp, *Water conservation, Aquatic environment, Aquatic habitat, Economics, Federal government, Fishing, Legislation, Local government, Marshes, Public lands, Recreation, Shallow water, State governments, Water quality.

The Everglades National Park does not contain all of the famous 'river of grass' known as the Everglades. Large as it is, the park does not include the northern and eastern reaches of the swamp, although it remains dependent upon the continued flow of water from those areas. Currently, the park's most critical concern is over an area known as Taylor Slough, approximately ninety square miles of which lie outside of the park. The immediate economic interests of private corporations seem to favor responding to increased pressure for agricultural, industrial and residential development in the region. Section 208 of the FWPCA which establishes state responsibility for water management planning to achieve comprehensive state plans controlling future use and development of waters within the state is a key provision which has been selected for special demonstration projects. Although the proposed 208 demonstration project for the park is only beginning to take shape in raw outlines, the future of both the plan and the park looks bright. (Jordan-Florida)
W78-08349

THE FEDERAL RECLAMATION PROGRAM.
For primary bibliographic entry see Field 5G.
W78-08350

THE STORY OF A DAM,
W. Wieking.
Western Water, p 3-8, November-December 1977.

Descriptors: *Dam construction, *Dam design, *Dam failure, *Earthquake engineering, *Seismic design, Disaster, Construction, Dams, Dam sites, Floods, Flood damage, Arch dams, Concrete dams, California, Earthquakes, Engineering geology, Seismic studies, Water storage, Political aspects, Governmental interrelations, Federal government, State governments, Flood control, Central Valley Project.

Construction on the Auburn Dam in California's Central Valley was scheduled to begin late in 1965. However, the U.S. Bureau of Reclamation Project has not yet gotten past the excavation stage. In the meantime, the project's estimated cost has increased from $427,000,000 to $1.1 billion. Concern over what effects an earthquake would have on the dam has been the project's main obstacle. Three state review boards are currently studying the safety question. Their findings will be fowarded to the Department of Interior, the President, and Congress for a final decision on the dam. Opponents of the dam cite a report which claims that a major earthquake would crack the dam and cause disastrous floods in the region, which includes Sacramento. Proponents maintain that the dam could withstand any earthquake likely to occur. They say the dam would in fact provide flood control for the area. Proponents of the project also point out that it would provide hydroelectric power, additional water for agriculture, and the recreational value of the reservoir. In reply, opponents state that the natural recreational value of the American River Canyon would be destroyed by the dam. (Malefatto-Florida)
W78-08351

IMPORTANCE OF ANALYSES FOR YOUR NPDES PERMIT,
Abbott Labs., North Chicago, IL. Corporate Environmental Services.
For primary bibliographic entry see Field 5G.
W78-08352

WATER POLLUTION REMEDIES--USE OF PUBLIC NUISANCE THEORY IN SUIT BY FEDERAL AND STATE GOVERNMENTS,
For primary bibliographic entry see Field 5G.
W78-08353

A LEGISLATIVE-POLITICAL HISTORY OF THE COASTAL ZONE MANAGEMENT ACT OF 1972,
Wisconsin Univ.-Madison. School of Law.
Z. L. Zile.

Coastal Zone Management Journal, Vol 1, No 3, p 235-274 (1974). 152 ref.

Descriptors: *Coasts, *Management, *Planning, *Legislation, *Comprehensive planning, Future planning(Projected), Long-term planning, Decision making, Estimated benefits, Estimated costs, Governments, Federal government, Administrative agencies, Social aspects, Coastal engineering, Land development, Land management, Regulation, Legal aspects, Water law, Zoning, Oceans, Estuaries, *Coastal Zone Management Act of 1972, *Estuary Protection Act, *Marine Resources and Engineering Development Act of 1966, Coastal waters, Coastal zone management, Congressional hearings.

The Coastal Zone Management Act (CZMA) of 1972 was signed late in an election year with presidential misgivings. It was fiscally starved thereafter. It is poorly drafted, deficient in substantive standards, vague on policy, and uncertain regarding agency responsibility. The Act developed in four distinct phases, each emphasizing a different concern of coastal management. The earliest expressed public interest had a recreational bias. This was brought about by the advent of more leisure time, and the need for more parks. Along with the desire to save our shorelines for recreational purposes, came the desire to protect critically endangered coastal habitats. Known as the estuary protection phase, this era was characterized by extensive debate and numerous hearings conducted in both houses of Congress; it eventually resulted in the Estuary Protection Act. The next phase concerned coastal planning. Interest for this phase developed in response to the Water Resources Planning Act. The same concern for coastal management was echoed in the Marine Resources and Engineering Development Act of 1966. Almost simultaneously with the ocean management phase emerged the land use policy phase. This was spawned by the growing concern at all levels of government for comprehensive master plans for future development. The Coastal Zone Management Act of 1972 reflects each of these antecedent phases, and it fails in its attempt to weave them into a consistent whole. (Moorhouse-Florida)
W78-08355

PRELIMINARY LEGAL CONSIDERATIONS IN DEVELOPING ARTIFICIAL REEFS,
Texas A and M Univ., College Station. Dept. of Management.
J. L. Seymour.
Coastal Zone Management Journal, Vol 2, No 2, p 149-169 (1975). 3 fig, 80 ref.

Descriptors: *Reefs, *Project planning, *International law, *Fish management, Federal Water Pollution Control Act, Law of the sea, Navigable waters, Continental shelf, Legal aspects, Governmental interrelations, Jurisdiction, Regulations, Supervisory control(Power), Federal government, Environmental effects, United Nations, Coastal structures, Fishing, Administrative agencies, *Coastal Zone Management Act(CZMA), *Coastal waters, *Coastal zone management, National Environmental Policy Act(NEPA), Territorial sea(Jurisdiction), Administrative regulations, Artificial reefs.

Artificial reefs appear to be a desirable means of optimizing our returns from the sea. These reefs, which can be constructed from a number of materials, pose numerous legal questions which need to be resolved. Of primary importance are issues surrounding the location, construction, operation, and management of the artificial reefs. Both state and federal regulatory policies will have a direct impact on these issues. On a general level, the Coastal Zone Management Act (CZMA) will insure that priorities balancing public interests allowing for both development and protection, preservation and restoration are considered. Specific protection of marine environment and fishery resources will be assured by the application of such laws as the National Environmental Policy Act (NEPA), the Fish and Wildlife Coordination Act, the Marine Protection, Research and Sanctuaries Act, the Continental Shelf Act, and the Federal Water Pollution Control Act (FWPCA). Jurisdictional aspects of control relating to ownership of artificial reefs is affected not only by state and federal territorial policies, but also by the lack of international agreement on the law of the sea. Efforts are now under way in the United Nations to resolve this problem. (Petruff-Florida)
W78-08357

A DECADE OF NONDEGRADATION POLICY IN CONGRESS AND THE COURTS: THE ERRATIC PURSUIT OF CLEAR AIR AND CLEAN WATER,
Iowa Univ., Iowa City. Coll. of Law.
For primary bibliographic entry see Field 5G.
W78-08393

CONCLUSIONS DRAWN FROM THE REVIEW OF ENVIRONMENTAL POLICIES OF JAPAN.
Organization for Economic Co-operation and Development, Paris (France).
For primary bibliographic entry see Field 5G.
W78-08397

U. S. ARMY CORPS OF ENGINEERS PERMIT PROGRAM, A GUIDE FOR APPLICANTS,
Office of the Chief of Engineers (Army), Washington, D.C.
Report EP 1145-2-1. November, 1977. 20 p.

Descriptors: *Rivers and Harbors Act, *Permits, *Administrative agencies, Legislation, Wetlands, Rivers, Navigation, Regulation, Legal aspects, Corps of Engineers.

This pamphlet is designed to assist a person applying for a Corps of Engineers permit. Permits are required for authorizing structures and work in or affecting navigable waters of the United States, the discharge of dredged or fill material into waters of the United States, and the transportation of dredged material for the purpose of dumping it into ocean waters. The pamphlet is not intended to be a complete description of all aspects of the permit program, but will provide basic, general information of a non-technical nature. Full explanation of the program may be found in the regulations, 33 Code of Federal Regulations, Parts 320 through 329. (Steiner-Mass)
W78-08405

LEGISLATION NEEDED TO PROMOTE CONSERVATION AND RECYCLING,
Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5G.
W78-08497

POLITICAL EFFICIENCY AND POLITICAL EFFECTIVENESS IN WATER-RELATED POLICY AREAS: A REPORT OF RESEARCH RESULTS ON THREE STATE AGENCIES IN OREGON,
Oregon State Univ., Corvallis. Dept. of Political Science.
W. B. Shepard, and D. J. Doubleday.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-283 060, Price codes: A07 in paper copy, A01 in microfiche. Water Resources Research Institute, Oregon State University, Completion Report No. WRRI-55, November 1977. 132 p, 29 tab, 2 append. OWRT A-030-ORE(1).

Descriptors: *Political aspects, State agencies, *Institutional cooperation, *Water policy, *Local governments, *State governments, *Oregon, Legal aspects, *Institutional constraints.

Major objectives were to study: (1) the nature and salience of local concerns with respect to the structure and substance of state policies affecting the use of water resources; (2) the various state policies and procedures which will likely elicit voluntary local compliance or substattial and potentially effective resistance at the local level; and (3) those aspects of water policy which may be successfully established in a uniform manner for large areas of the state and those portions of state water policy for which considerable flexibility would appear requisite given varying desired and consumptive preferences among localities. Specific conclusions are presented under the following sections: Local concerns about state water-related policies and agencies; Uniformity and flexibility in state water-related policy; and Factors facilitating and inhibiting local compliance.
W78-08519

WINTER'S DOCTRINE: A REVIEW,
Nevada Univ., Reno. Dept. of Civil Engineering.
J. W. Bird.
ASCE Journal of the Irrigation and Drainage Division, Vol. 103, No. IR4, p 395-400, December, 1977. 9 ref, 1 append.

Descriptors: *Appropriation, Beneficial use, Federal government, State government, *Water law, *Water rights, *Winter's Doctrine, *Reviews, *Indian reservations, Indian water rights.

The western states are areas of short water supply. In general, they apply the water law doctrine of appropriation that relates a water right to the time or date that the right started. The Federal government has applied for water rights at a much later time, but with an early appropriation date. This would give the Federal agencies priority over the existing water users, many of which have been beneficially using the water for years. Since the Federal agencies apparently have decided, through the courts, their ability to act unilaterally in this matter, it is apparent that guidance from the Congress is sorely needed in this matter. Otherwise the state's water laws shall be greatly weakened, along with state water planning and policy. (Skogerboe-Colorado State)
W78-08718

DRAINAGE LAW ASSISTS LAND DRAINAGE,
Guelph Univ. (Ontario). Dept. of Engineering.
R. W. Irwin, and J. R. Johnston.
American Society of Agricultural Engineers, Saint Joseph, Michigan, Paper Number 77-2560, (1977). 12 p, 59 fig.

Descriptors: *Drainage, Drainage systems, Drains, Drainage practices, *Water law, *Drainage laws, Legal aspects, *Canada(Ontario).

Drainage law in Ontario is integrated to provide systems of procedures, financing and inspections to ensure that agricultural drainage proceeds in a deliberate and fair way. The law covers the construction of outlet drains, on-farm tile drains and the regulation of the drainage construction industry. (Skogerboe-Colorado State)
W78-08722

PHASE II, ARIZONA STATE WATER PLAN: ALTERNATIVE FUTURES,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 6B.
W78-08725

A WATER SUPPLY DATA BASE,
Arizona Univ., Tucson. Management Information Systems.
For primary bibliographic entry see Field 7C.
W78-08726

ARIZONA WATER POLICY: CHANGING DECISION AGENDAS AND POLITICAL STYLES,
Arizona Univ., Tucson. School of Renewable Natural Resources.
H. J. Cortner, and M. P. Berry.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 7, Proceedings, Meetins of the American Water Resources Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, April 15-16, 1977, Las Vegas, Nevada, p. 7-14. 35 ref.

Descriptors: *Political aspects, Constraints, *Institutional constraints, Administration, Area development, Jurisdiction, *Water resouces development, Governmental interrelations, Local governments, Institutions, *Public utilities, *Water control, Water utilization, *Arizona, *Water policy.

It is argued that Arizona has traditionally and persistently pursued a style of politics in which state government is a reactor rather than an initiator, and that its role has been subordinate to the federal government and local and private water users. The lack of adequate water policies has led to an inability to respond to new conditions and demands, such as conflicts among traditional water users, Indian claims, rising water costs, energy developments and environmental concerns. Past themes of administrative fragmentation and lack of concern over water and water planning have been responsible for these deficiencies. There is some evidence that the customary decision-making process is changing and the state is establishing its own water planning capability. (Payton-Arizona)
W78-08727

ALTERNATIVE ENERGY SOURCES IN THE USSR,
Royal Swedish Academy of Science (Stockholm).
For primary bibliographic entry see Field 3F.
W78-08736

POLITICAL, SOCIAL, AND ECONOMIC ASPECTS OF SOIL EROSION AND SEDIMENTATION CONTROL PROGRAMS,
Ohio State Univ., Columbus. Dept. of Agronomy.
F. E. Heft.
In: Proceedings of the National Symposium on Soil Erosion and Sedimentation by Water, Chicago, Illinois, December 12-13, 1977. p 23-30.

Descriptors: *Economics, Erosion, Sediments, *Soil erosion, *Political aspects, *Social aspects, Social values, *Erosion control, Sediment control.

The politics and economics of soil erosion and sedimentation controls on private land through management practices have the potential of a significant economic impact on the owner should such controls be unreasonable. The lack of these control practices generates significant economic impacts upon the off-site systems and enterprises requiring sediment-free water and minimum depth drainage outlets and navigable channels. Significant in addressing economic aspects is the basic capability of an industry or system to add their control costs into their product price to the consumer. The agricultural community is uniquely void of this capability and must be given consideration for economic compensation for those control practices required which are not cost beneficial. In Ohio, at the request of the legislative branch, a brief economic evaluation was made of proposed soil erosion and sedimentation control legislation. (See also W78-08787) (Skogerboe-Colorado State)
W78-08790

6F. Nonstructural Alternatives

COMPREHENSIVE FLOOD PLAIN STUDIES USING SPATIAL DATA MANAGEMENT TECHNIQUES,
Hydrologic Engineering Center, Davis, CA.
D. W. Davis.
Water Resources Bulletin, Vol. 14, No. 3, p 587-604, June 1978. 4 fig, 5 tab, 8 ref.

Descriptors: *Floodplains, *Planning, *Assessment, *Management, *Methodology, *Computer models, Flood damage, Environmental effects, Urban hydrology, *Spatial analysis, *Data management, Computer programs, Land use, Watersheds(Basins), Systems analysis.

A pilot study undertaken to develop and test analytical methodologies for application in comprehensive flood plain information studies is described. The methodology permits and encourages comprehensive, systematic, practical assessments of present and alternative future basin-wide development patterns as reflected by alternative land use patterns and physical works in terms of flood hazard, economic damage potential and selected environmental consequences. The analysis methodologies are centered around integrated use of computerized spatial, gridded geographic and resouce data files. A family of special purpose utility computer programs access the data file and extract appropriate variables and interpret and format the data into specific analytical parameters that are subsequently formatted for input to traditional modeling computer programs. An example application to Trail Creek in Clarke County, Georgia is described. (Graf-Cornell)
W78-08307

6G. Ecologic Impact Of Water Development

OSO CREEK FLOOD CONTROL PROJECT AREA, NUECES COUNTY, TEXAS: A REPORT ON THE ARCHAEOLOGICAL AND HISTORICAL RESOURCES,
Texas Univ. at Austin, TX.
For primary bibliographic entry see Field 4A.
W78-08229

A PRELIMINARY ASSESSMENT OF THE ENVIRONMENTAL IMPACTS FROM OIL SHALE DEVELOPMENTS,
TRW, Inc., Redondo Beach, CA. Environmental Engineering, Div.
For primary bibliographic entry see Field 5C.
W78-08246

TRANSURANICS IN NATURAL ENVIRONMENTS.
Energy Research and Development Administration, Las Vegas.
For primary bibliographic entry see Field 5B.
W78-08248

HYDROLOGIC AND ECOLOGIC INVENTORIES OF THE COASTAL WATERS OF WEST HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 2L.
W78-08311

PHYTOPLANKTON OF THE LOWER COLORADO RIVER, GRAND CANYON REGION,
Arizona State Univ., Tempe.
W. M. Crayton, and M. R. Sommerfeld.
Journal of the Arizona - Nevada Academy of Science, Vol 13, No 1, p 19-24, February, 1978. 1 fig, 2 tab, 24 ref.

Descriptors: *Phytoplankton, *Diatoms, Plankton, Water sampling, On-site data collections, Hydrologic data, *Colorado River, Aquatic microorganisms, *Arizona.

The purpose of this investigation was to determine the phytoplankton species composition, population size, and distribution within a study area of the Colorado River, extending from Lees Ferry to Diamond Creek. Sampling for phytoplankton, at 33 sites 1975-76, revealed a total of 63 genera and 127 species, including 73 diatoms. Dominant species were Diatom vulgare Bory, Rhoicosphinia curvata (Kutz.) Grun and Cocconeis pediculus Ejr. A detailed list of the phytoplankton species and their relative abundance was included in the report. This section of the Colorado was found to have a small, evenly distributed phytoplankton population, dominated by tychoplankters. The presence of the tychoplanktonic forms probably resulted from widely fluctuating river levels, high current velocity, and turbulence. Few euplanktonic species were found in the river. Low water temperature, high turpidity, and limited age of the water appear to preclude the development of a larger euplanktonic population. (Jewkes-Arizona)
W78-08354

LIMNOLOGICAL CHARACTERISTICS AND FISHERY POTENTIAL OF MAN-MADE DESERT PONDS,
Arizona Cooperative Fishery Research Unit, Tucson.
For primary bibliographic entry see Field 2H.
W78-08356

A LOG OF THE VERDE THE 'TAMING' OF AN ARIZONA RIVER,
Northern Arizona Univ., Flagstaff. Center for Intergrated Studies.
For primary bibliographic entry see Field 5C.
W78-08373

WHO KILLED THE GILA,
Florida Univ., Gainesville.
For primary bibliographic entry see Field 5C.
W78-08375

CONCLUSIONS DRAWN FROM THE REVIEW OF ENVIRONMENTAL POLICIES OF JAPAN.
Organization for Economic Co-operation and Development, Paris (France).
For primary bibliographic entry see Field 5G.
W78-08397

LAGOON OF ISLANDS, TASMANIA--DEATH KNELL FOR A UNIQUE ECOSYSTEM,
Tasmania Univ., Hobart (Australia). Dept. of Botany.
P. A. Tyler.
Biological Conservation, Vol. 9, No. 1, p 1-11, January, 1976. 9 fig, 5 ref.

Descriptors: *Islands, Sedges, Reeds, Water level, *Ecosystems, Dams, Wetlands, Water storage, Lake basins, *Lagoon of Islands(Tasmania), *Island formation, Floating mat, Callistemon viridiflorus, Australia.

Lagoon of Islands is a partly filled-in lake basin covered by a floating mat of rhizomatous Chorisandra cymbaria and Baumea rubiginosa (Cyperaceae) on which islands are formed by a graphic process. Tussocks of Carex appressa are colonized first by herbaceous then by woody plants, forming a growing island. The accumulating weight of an island leads to its own destruction by sinking and waterlogging. This unique aquatic site is seriously threatened by the use of the basin as a minor water storage site. (Stihler-Mass)
W78-08417

POPULATION CHANGE, MIGRATION AND DISPLACEMENT ALONG THE MCCLELLAN-KERR RIVER NAVIGATION SYSTEM,
Missouri Univ.-Columbia. Dept. of Sociology.
For primary bibliographic entry see Field 6B.
W75-08426

FINAL ENVIRONMENTAL IMPACT STATEMENT--CITY OF JACKSONVILLE, FLORIDA WASTEWATER MANAGEMENT FACILITIES, ARLINGTON-EAST SERVICE DISTRICT.
Environmental Protection Agency, Atlanta, GA. Region IV.
For primary bibliographic entry see Field 5D.
W78-08506

DIRECT ENVIRONMENTAL FACTORS AT MUNICIPAL WASTEWATER TREATMENT WORKS--EVALUATION AND CONTROL OF SITE AESTHETICS, AIR POLLUTANTS, NOISE AND OTHER OPERATION AND CONSTRUCTION FACTORS,
For primary bibliographic entry see Field 5G.
W78-08507

PROGRAM REVIEW PROCEEDINGS OF: ENVIRONMENTAL EFFECTS OF ENERGY RELATED ACTIVITIES ON MARINE/ESTUARINE ECOSYSTEMS.
Environmental Protection Agency, Washington, D.C. Office of Energy, Minerals, and Industry; and Environmental Protection Agency, Washington, D.C. Office of Research Development.
For primary bibliographic entry see Field 5C.
W78-08520

ECOLOGICAL CHARACTERIZATION: AN AID TO DECISION MAKING,
Fish and Wildlife Service, Bay Saint Louis, MS. Office of Biological Services.
For primary bibliographic entry see Field 5C
W78-08525

AN ECOLOGICAL CHARACTERIZATION OF THE CHENIER PLAIN OF SOUTHWESTERN LOUISIANA AND SOUTHEASTERN TEXAS: OBJECTIVES AND METHODOLOGIES,
Energy Resources Co., Inc., Cambridge, MA.
For primary bibliographic entry see Field 2L.
W78-08526

THE CONSTRUCTION OF A CONCEPTUAL MODEL OF THE CHENIER PLAIN COASTAL ECOSYSTEM IN TEXAS AND LOUISIANA,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources; Florida Univ., Gainesville. Center for Wetlands; and Energy Resources Co., Cambridge, MA.
For primary bibliographic entry see Field 2L.
W78-08527

FATE AND EFFECTS OF CONTAMINANTS MARINE ECOSYSTEMS AND ORGANISMS,
National Oceanographic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
For primary bibliographic entry see Field 5C.
W78-08528

LABORATORY AND FIELD STUDIES ON THE LONG-TERM EFFECTS OF PETROLEUM HYDROCARBONS ON BENTHIC MARINE INVERTEBRATES,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Labs.
For primary bibliographic entry see Field 5C.
W78-08529

ENVIRONMENTAL ASSESSMENT OF NORTHERN PUGET SOUND AND THE STRAIT OF JUAN DE FUCA,
National Oceanographic and Atmospheric Administration, Seattle, WA.
For primary bibliographic entry see Field 5C.
W78-08530

ENVIRONMENTAL ASSESSMENT OF AN OFFSHORE OIL FIELD: A PROGRESS REPORT,
National Marine Fisheries Service, Galveston, TX. Southeast Fisheries Center.
For primary bibliographic entry see Field 5C.
W78-08531

A STANDARD PROGRAM FOR ENVIRONMENTAL IMPACT ASSESSMENT: PHASE I--ICHTHYOPLANKTON SAMPLING,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
M. A. M. Hyman, E. Lorda, and S. B. Saila.
In: 'Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems', Report No. EPA-600/7-77-111 and OEMI-77-025, October 1977. p 153-159.

Descriptors: *Plankton, *Water pollution effects, *Sampling, *Model studies, Baseline studies, Environmental effects, *Outer Continental Shelf, Environmental assessment, Ichthyoplankton, Narragansett Bay.

The complexity of estuarine ecosystems and the growing need for proper management decisions and regulations have placed a high priority on large-scale integrated models. However the practical effectiveness of predictions from such a model is limited. It is suggested that a successful environment impact assessment program is predicated on a sequence of carefully planned experiments designed to answer specific questions, rather than on a general measurement system. This carefully planned standard program can then be used for establishing suitable guidelines for more routine types of assessment. To assign sources of variability in ichthyoplankton surveys more accurately, an intensive sampling scheme was proposed for a single site. The purpose of this study was to work toward producing a standard program for ichthyoplankton sampling. If variability is assigned to various effects, as opposed to being confined into an overall error term, data will be of an overall higher consistency and, thus, generally more useful. Specifically, once this variability is better understood, any modeling effort should prove more productive. (See also W78-08520) (Sinha - OEIS)
W78-08532

EFFECTS OF CHEMICAL USE IN OFFSHORE WELL-DRILLING OPERATIONS,
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 5C.
W78-08533

THE CHEMISTRY AND ECOLOGICAL EFFECTS OF CHLORINATION OF SEAWATER: A SUMMARY OF EPA RESEARCH PROJECTS,
Environmental Research Lab., Johns Island, SC. Bears Bluff Field Station; Miami Univ., FL. Div. of Chemical Oceanography.
For primary bibliographic entry see Field 5C.
W78-08534

POWER PLANT COOLING WATER CHLORINATION IN NORTHERN CALIFORNIA,
California Univ., Berkeley. Coll. of Engineering; and California Univ., Berkeley. School of Public Health.
For primary bibliographic entry see Field 5B.
W78-08535

ENVIRONMENTAL REQUIREMENTS AND POLLUTIN TOLERANCE OF COMMON FRESHWATER CHIRONOMIDAE,
Florida Agricultural and Mechanical Univ., Tallahassee. Lab. of Aquatic Entomology.
For primary bibliographic entry see Field 5C.
W78-08636

ECOSYSTEM PROCESSES AND ORGANIC CONTAMINANTS: RESEARCH NEEDS AND AN INTERDISCIPLINARY PERSPECTIVE,
Institute of Ecology, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-08649

THE EFFECTS OF PRECIPITATION ON AQUATIC AND TERRESTRIAL ECOSYSTEMS: A PROPOSED PRECIPITATION CHEMISTRY NETWORK, DEPT. OF ENVIRONMENTAL SCIENCES.
Virginia Univ., Charlottesville.
For primary bibliographic entry see Field 5C.
W78-08762

7. RESOURCES DATA

7A. Network Design

SHIPBOARD ENVIRONMENTAL DATA ACQUISITION SYSTEM,
National Weather Service, Silver Spring, MD.
For primary bibliographic entry see Field 5A.
W78-08541

THE HARMONIZATION OF THE MONITORING OF THE QUALITY OF INLAND FRESH WATER,
Department of the Environment, London (England).
For primary bibliographic entry see Field 5A.
W78-08548

7B. Data Acquisition

DEVELOPMENT OF A SYSTEM FOR CONDUCTING INTERLABORATORY TESTS FOR WATER QUALITY AND EFFLUENT MEASUREMENTS,
FMC Corp., San Jose, CA. Advanced Products Div.
For primary bibliographic entry see Field 5A.
W78-08227

APPLICATION OF REMOTE SENSING TO THE CHESAPEAKE BAY REGION: VOLUME 1 - EXECUTIVE SUMMARY.
National Aeronautics and Space Administration, Greenbelt, MD. Goodard Space Flight Center.
For primary bibliographic entry see Field 5A.
W78-08232

EFFLUENT MONITORING PROCEDURES: BASIC LABORATORY SKILLS - STUDENT REFERENCE MANUAL,
Charles County Community Coll., La Plata, MD.
For primary bibliographic entry see Field 5A.
W78-08233

REMOTE SENSING OF EFFECTS OF LAND USE PRACTICES ON WATER QUALITY,
Kentucky Univ., Lexington. Dept. Forestry.
For primary bibliographic entry see Field 5B.
W78-08237

SNOWMAPPING IN SOUTHERN NORWAY BY USE OF LANDSAT IMAGERY,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 2C.

W78-08238

SATELLITE REMOTE SENSING STUDY OF THE TRANS-BOUNDARY MOVEMENT OF POLLUTANTS,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 5B.
W78-08239

THERMAL REMOTE SENSING CALIBRATION TECHNIQUES,
Calspan Corp., Buffalo, NY.
J. R. Schott.
Available from the Nationala Technical Information Service, Springfield, VA 22161 as PB-269 471, Price codes: A06 in paper copy, A01 in microfiche. Report No. NYSERDA-75-22, Calspan NA-6019-M-1, March 15, 1977. 97 p, 28 fig, 7 tab, 28 ref, 7 append.

Descriptors: *Water temperature, *Remote sensing, *Aerial sensing, Aircraft, *Mapping, *Data collections, Data transmission, Data processing, Analytical techniques, Statistics, Radiometric image calibration, *Radiometry, Surface radiometric temperatures, Thermal mapping, Thermal plumes, Thermal scanning.

A technique for measuring water surface temperatures from airborne platforms was developed and is demonstrated. A number of techniques were tested and evaluated to determine their suitability and the precision with which surface water temperatures could be measured from the air. Approaches considered were wholly airborne requiring no ground truth and thus represent a major difference from current approaches which require ground data if true surface temperatures are to be calibrated. Data derived from boat measurements were compared. The mean of the absolute value of the differences between the two data sets is 0.70F, with a standard deviation of 0.59F (63 points considered), which compares quite favorably to a standard deviation of about 0.5F for successive measurements of the thermal data collected by the boat. Results indicate that wholly airborne monitoring and mapping of thermal plumes using the approaches described is an operational procedure with accuracies comparable to surface measurements. The improved mapping and quality control procedures developed, when combined with the advances in the theoretical approach to the radiometric physics, enable rapid collection, analysis and product generation. This greatly facilitates quantitative analysis in a rapid and cost effective manner. Sufficient detail is given to serve as a guide for using the approaches discussed for collection, calibration or mapping of power plant thermal discharges. (Seip-IPA)
W78-08241

AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA USING REMOTE SENSING TECHNIQUES,
California Univ., Berkeley.
For primary bibliographic entry see Field 4A.
W78-08244

DETERMINING THE USEFULNESS OF REMOTE SENSING FOR ESTIMATING AGRICULTURAL WATER DEMAND IN CALIFORNIA,
California Univ.-Berkeley. Remote Sensing Research Program.
For primary bibliographic entry see Field 3F.
W78-08256

MONITORING WATER QUALITY BY REMOTE SENSING,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 5A.
W78-08257

EVALUATION OF THE TECHNICON BLOCK DIGESTOR SYSTEM FOR TOTAL KJELDAHL NITROGEN AND TOTAL PHOSPHORUS,
Environmental Monitoring and Support Lab., Cincinnati, OH. Physical and Chemical Methods Branch.
For primary bibliographic entry see Field 5A.
W78-08260

MEASUREMENTS OF THE ENERGY FLUXES INVOLVED IN THE ENERGY BUDGET OF A SNOW COVER,
Atmospheric Environment Service, Downsview (Ontario).
For primary bibliographic entry see Field 2C.
W78-08272

TIME-SYNCHRONISED STAGE RECORDERS FOR THE MONITORING OF INCREMENTAL DISCHARGE INPUTS IN SMALL STREAMS,
Bristol Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2E.
W78-08284

DILUTION GAUGING ON THE RECESSION LIMB: 2. THE INTEGRATION METHOD,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 2E.
W78-08289

CHANNEL EROSION IN SOUTHWESTERN LOUISIANA CANAL,
California Univ., Los Angeles. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W78-08298

THE USE OF AERIAL COLOR INFRARED PHOTOGRAPHY IN MAPPING THE VEGETATION OF A FRESHWATER MARSH,
American Univ., Washington, DC. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-08421

TESTSETS FOR THE QUANTITATIVE ANALYSIS OF AQUEOUS SOLUTIONS WITH PERMANENT INDICATION (TESTSETS FUR DIE QUANTITATIVE ANALYSE WAESSRIGER LOESUNGEN MIT BLEIBENDER ANZEIGE),
For primary bibliographic entry see Field 5A.
W78-08467

THE EFFECT OF QUICK FREEZING ON THE CONTENT OF ORGANIC WATER CAPACITY SUBSTANCES (DIE WIRKUNG DES TIEFGEFRIERENS AUF DEN GEHALT AN ORGANISCHEN WASSERINHALTSTOFFEN),
For primary bibliographic entry see Field 5A.
W78-08469

1984 IS APPROACHING--WHAT DOES IT MEAN TO THE WASTE-WATER SERVICE,
Thames Water Authority, London (England). Metropolitan Public Health Div.
For primary bibliographic entry see Field 5D.
W78-08499

STANDARDIZATION AND INTERCALIBRATION TECHNIQUES FOR MARINE MONITORING,
National Ocean Survey, Rockville, MD. Test and Evaluation Lab.
For primary bibliographic entry see Field 5A.
W78-08538

THE UNDERWAY WATER SAMPLING SYSTEM,
National Ocean Survey, Rockville, MD. Engineering Development Lab.
For primary bibliographic entry see Field 5A.
W78-08540

CALIBRATION STABILITY AND RESPONSE TIME FOR SALINITY SENSORS,
Agricultural Research Service, Riverside, CA. Salinity Lab.
For primary bibliographic entry see Field 2G.
W78-08559

A SOIL COLUMN TENSION LYSIMETER THAT MINIMIZES EXPERIMENTAL EDGE EFFECTS,
Dartmouth Coll., Hanover, NH. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2G.
W78-08565

A DEVICE TO EXCLUDE DUST FROM RAIN-WATER SAMPLES,
Nature Conservancy, Grange-over-Sands (England). Merlewood Research Station.
For primary bibliographic entry see Field 2B.
W78-08578

WATER WELL MONITOR,
For primary bibliographic entry see Field 4B.
W78-08593

BACK FLUSHING FILTER FOR SEWAGE ANALYSER--WITH SEMICIRCULAR DEFLECTOR IN CENTRAL SECTION FLANKED BY SINTER FILTER DISCS.
Netherlands Patent NL 7707-801. Issued January 17, 1978. Derwent Netherlands Patents Report, Vol. A, No. 5, p 7, March, 1978.

Descriptors: *Filters, *Instrumentation, *Filtration, *Patents, *Monitoring, *Design criteria, Construction materials, Equipment, Sewage treatment, Waste water treatment, Municipal wastes.

A back-flushing filter system employing sintered filter discs to clear sewage upstream of a water quality meter in a waste water flow has been patented. The system contains sintered filter discs on either side of a central section; the discs are positioned beneath covers to clarified water outlets. The central section is equipped with a peripheral inlet for introducing raw waste water. The influent strikes a semicircular, perforated deflector plate located in the central section. The filter discs are backwashed by blocking one of the clarified water outlets with compressed air. As the other filter disc becomes operational, the filter cake formed on the first filter disc is washed away by a back flow of clarified water. The system reduces the need for frequent replacement of the filters and extends the filters' functional life span. (Lisk-FIRL)
W78-08691

VALIDATION OF USE OF DYE-DILUTION METHOD FOR FLOW MEASUREMENT IN LARGE OPEN AND CLOSED CHANNEL FLOWS,
Peerless Pump, Montebello, CA.
For primary bibliographic entry see Field 8B.
W78-08701

THE DESIGN OF OPEN CHANNEL ACOUSTIC FLOWMETERS FOR SPECIFIED ACCURACY: SOURCES OF ERROR AND CALIBRATION TEST RESULTS,
Ocean Research Equipment, Inc., Falmouth, MA. Accusonic Div.
For primary bibliographic entry see Field 8B.

W78-08702

NUMERICAL MODELING OF TWO-DIMENSIONAL FLUMES,
National Bureau of Standards, Washington, DC. Mechanics Div.
For primary bibliographic entry see Field 8B.
W78-08703

INSTRUMENT ERRORS IN OPEN CHANNEL FLOW MEASUREMENT SYSTEMS,
Instrumentation Specialties Co., Lincoln, NE.
For primary bibliographic entry see Field 8B.
W78-08704

COMPENSATING FOR CONSTRUCTION ERRORS IN CRITICAL-FLOW FLUMES AND BROAD-CRESTED WEIRS,
Agricultural Research Service, Phoenix, AZ. Water Conservation Lab.
For primary bibliographic entry see Field 8B.
W78-08705

ERRORS IN FLOW MEASUREMENT AND THEIR IMPORTANCE IN INFILTRATION/INFLOW ANALYSIS,
Environmental Quality Systems, Inc., Rockville, MD.
For primary bibliographic entry see Field 8B.
W78-08706

A NEW DIELECTRIC SOIL MOISTURE METER FOR FIELD MEASUREMENT OF SOIL MOISTURE,
Technical Univ. of Prague (Czechoslovakia). Dept. of Irrigation and Drainage.
For primary bibliographic entry see Field 2G.
W78-08707

7C. Evaluation, Processing and Publication

REMOTE SENSING INPUTS TO LANDSCAPE MODELS WHICH PREDICT FUTURE SPATIAL LAND USE PATTERNS FOR HYDROLOGIC MODELS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 4A.
W78-08236

SNOWMAPPING IN SOUTHERN NORWAY BY USE OF LANDSAT IMAGERY,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 2C.
W78-08238

A USER'S GUIDE FOR REDEQL-EPA: A COMPUTER PROGRAM FOR CHEMICAL EQUILIBRIA IN AQUEOUS SYSTEMS,
Corvallis Environmental Research Lab., OR. Marine and Freshwater Ecology Branch.
For primary bibliographic entry see Field 5A.
W78-08262

A MATHEMATICAL MODEL OF STRATIFIED GROUNDWATER FLOW,
Egyptian Desert Inst., Cairo. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-08291

SENSIBILITY OF PARAMETERS OF THE SSARR MODEL (SENSIBILITE DES PARAMETRES DU MODELE SSARR),
Hydro-Quebec, Montreal. Service Hydraulique.
For primary bibliographic entry see Field 2A.
W78-08293

FORMAT FOR ACQUIRING RAPID DATA ANALYSIS CAPABILITIES OF STORED DATA: MANIPULATION OF NATIONAL EUTROPHICATION SURVEY WATER QUALITY DATA,
Environmental Monitoring and Support Lab., Las Vegas, NV. Monitoring Operations Div.
For primary bibliographic entry see Field 5A.
W78-08377

HYDROGEOLOGY OF THE MEDICINE HAT AREA, ALBERTA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 4B.
W78-08580

A COMPUTER PROGRAM FOR THE ANALYSIS OF MACROINVERTEBRATE DATA FROM WATER QUALITY SURVEYS,
Army Armament Research and Development Command, Aberdeen Proving Ground, MD. Chemical Systems Lab.
For primary bibliographic entry see Field 5A.
W78-08646

RECOMMENDATIONS OF THE EPA/NBS WORKSHOP ON THE NATIONAL ENVIRONMENTAL SPECIMEN BANK,
National Bureau of Standards, Washington, DC. Analytical Chemistry Div.
For primary bibliographic entry see Field 5A.
W78-08652

A WATER SUPPLY DATA BASE,
Arizona Univ., Tucson. Management Information Systems.
J. F. Nunamaker, D. E. Pingry, and R. Riley.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 7. Proceedings, Meetings of the American Water Resources Association, Arizona Section, and Arizona Academy of Science, Hydrology Section, April 15-16, 1977. Las Vegas, Nevada, p. 1-6. 1 tab, 3 fig.

Descriptors: Basic data collections, Information exchange, *Networks, Data collections, *Design, *System analysis, Operations research, Water data, Model studies, Regional analysis, Arizona, Colorado, Utah, New Mexico, Nevada, Wyoming, *Colorado River Basin, *Water supply, Southwest US.

A water supply data base was developed for the Colorado River Basin states as a guide to existing natural, technical, economic and legal water data agencies in Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming. This data was developed in order to determine whether water of acceptable quality and quantity could be delivered to specific locations at reasonable costs. Water data structure, data base design and data base implementation were discussed, with an emphasis on the Colorado River Basin Area. The thrust of the article deals with basic water supply data base construction rather than specific information. (Payton-Arizona)
W78-08726

8. ENGINEERING WORKS

8B. Hydraulics

HYDRAULIC DESIGN FOR COMBINED SEWER DIVERSION,
Worcester Polytechnic Inst., MA. Alden Research Lab.
B. J. Pennino, and R. A. Perkins.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY5, Proceedings Paper 13729, p 595-606, May 1978. 8 fig, 3 ref, 1 append.

Descriptors: *Combined sewers, *Diversion structures, *Water pollution control, *Model studies, Hydraulic models, Flow, Water levels, Sewers, Cities, Urban runoff, Head loss, Gates, Hydraulic structures, Water pollution, Hydraulics, *Richmond(Va), Retention basins, Flow distribution.

The City of Richmond is building two diversion structures that will join two existing sewers to a retention basin where combined sewage and storm runoff will be stored for later treatment. This scheme will minimize the discharge of combined sewage to the James River. Levels in the sewers and diversion structures vary with flow, river level, and interaction between the connected diversion structures. In order to accurately predict and minimize levels in the sewers upstream of the diversion structures, a 1:18 hydraulic model was tested. The model showed that levels could be reduced in both the 'flow to the river' mode and 'diversion' mode by streamlining various elements of the diversion structures. A flow distribution device reduced unacceptably high velocities at the trash screens. (Sims-ISWS)
W78-08269

RESPONSE OF OPEN-BOTTOM FLOATING PLATFORMS TO WIND,
Columbia Univ., New York. Dept. of Civil Engineering.
M. Shinozuka, S. S. Fang, K. Kitutake, and G. Matsui.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 104, No HY5, Proceedings Paper 13730, p 607-622, May 1978. 11 fig, 26 ref, 2 append. NSF ENG75-13761.

Descriptors: *Offshore platforms, *Winds, *Floating, *Model studies, Mathematical models, Floats, Wind pressure, Effects, Hydrodynamics, Monte Carlo processes, Frequency, Hydraulics, Structures, Floating bodies, Mooring, Time dependence.

The motion response of a moored open-bottom floating platform was examined by a time-domain simulation technique, derived by the impulse response method that takes into consideration the frequency dependency of the fluid reactive force terms i.e., added mass and damping force coefficients. The sway and roll responses of the moored platform to random wind loading were evaluated by solving the equations of motion using a simulated random wind loading history. The hydrodynamic coefficients of the open-bottom platform, with pressurized subdivided air chambers having a free air-water interface, were evaluated by modified Frank's close-fit method. Numerical examples of the motion response of the floating platform were presented. The results were used to study the effect of the variation of mooring system elasticity on platform response. (Sims-ISWS)
W78-08270

BASIN DYNAMICS, CHANNEL PROCESSES, AND PLACER FORMATION: A MODEL STUDY,
Victoria Univ., Wellington (New Zealand).
For primary bibliographic entry see Field 2J.
W78-08273

EXPERIMENTS ON SURFACE BUOYANT JET,
Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 5B.
W78-08280

MODEL FOR SHORE-ATTACHED THERMAL PLUMES IN RIVERS,
NALCO Environmental Sciences, Northbrook, IL.
For primary bibliographic entry see Field 5B.
W78-08281

SYSTEM OF SLIGHTLY IMMERSED GATES,
Technion - Israel Inst. of Tech., Haifa. Hydrodynamics and Hydraulic Engineering Lab.
For primary bibliographic entry see Field 8C.
W78-08295

CHANNEL EROSION IN SOUTHWESTERN LOUISIANA CANAL,
California Univ., Los Angeles. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W78-08298

A REVIEW OF THE HYDRAULICS OF GRAVITY DRAINAGE, WASTE AND VENT SYSTEMS,
Stevens Inst. of Tech., Hoboken, NJ. Davidson Lab.
T. P. Konen.
Plumbing Engineer, Vol 6, No 2, p 11-15, March-April, 1978. 4 fig, 3 tab, 5 ref.

Descriptors: *Hydraulic jump, *Hydraulic properties, *Pipes, *Hydraulic conduits, *Domestic wastes, Plumbing, Sewerage, Hydraulic systems, Velocity, Flow characteristics, Waste water disposal, Municipal wastes.

The hydraulic characteristics of drainage, waste, and vent systems in domestic sewerage are described. Water closets operate with an average daily water consumption of 100 gal, reaching a peak flow of 30 gpm; lavoratories achieve a peak flow of 10 gpm over a discharge period of 12 seconds; and bathtubs rapidly reach a peak discharge of 12 gpm. Water flowing through a horizontal pipe, with constantly varying velocity and depth of flow, occupies half the pipe's capacity. Vertical drains or stacks maintain a rapid annular flow within a short distance from discharge. When the flow in a vertical pipe is transferred into a horizontal pipe, the decrease in velocity from 15 ft/sec to 2 ft/sec causes a hydraulic jump or an increase in depth of flow in the horizontal pipe. Relief vents and vent stacks alleviate the pressure at the base of the vertical stack. A comparison of surge durations in conventional and water saving toilets, as calculated by the ratio of volume and peak flow, indicates that a one-second difference in duration results in a 2% velocity difference between the systems. Velocity of discharge from a water closet is considered in calculating the depth of flow and velocity in primary and secondary branch pipes. (Lisk-FIRL)
W78-08431

RAINFALL ANALYSIS FOR THE DESIGN OF STORM SEWERS IN BOMBAY,
Associated Industrial Consultants, Bombay (India).
For primary bibliographic entry see Field 2B.
W78-08433

GROUND WATER MANUAL, A GUIDE FOR THE INVESTIGATION, DEVELOPMENT, AND MANAGEMENT OF GROUND-WATER RESOURCES.
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 2F.
W78-08542

A NEW APPROACH TO FULLY GRAPHICAL (DIMENSIONAL) SOLUTION OF THE COLEBROOK-WHITE FUNCTION,
University of Strathclyde, Glasgow (Scotland). Dept. of Civil Engineering.
D. I. H. Barr.
Journal of the Institution of Water Engineers and Scientists, Vol. 32, No. 1, p 19-30, January 1978. 3 fig, 1 tab, 14 ref, 2 append.

Descriptors: *Pipe flow, *Graphical analysis, *Analytical techniques, Graphical methods, Curves, Mathematical studies, Dimensional analysis, Flow resistance, Discharge(Water), Analysis, Charts, *Colebrook-White function.

The basis of Ackers' system of dimensional design charts was outlined, and an alternative approach to fully dimensinal working of the standard pipe flow problems was given. The difficuly which has been overcome is the incorporation of the high resolution solution routes, which become available when the modified friction factor is adopted as solution group, within a dimensional rather than a non-dimensional graphical system. This then allows a number of potential developments. In particular, there was given a single page composite diagram, for practical use, wherein the degree of resolution is similar to that attained in the aforementioned charts, these being considered to have set a satisfactory standard for practical purposes. Other possible developments and applications included non-circular conduits and open channels. (Humphreys-ISWS)
W78-08552

RESULTS OF PUMPING TESTS IN CRYSTALLINE-ROCK AQUIFERS,
Geraghty and Miller, Inc., Tampa, FL.
For primary bibliographic entry see Field 4B.
W78-08556

DYNAMIC RESPONSES OF FLOATING STRUCTURES,
Exxon Production Research Co., Houston, TX.
J. C. Chao.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW2, Proceedings Paper 13769, p 105-118, May 1978. 20 fig, 1 tab, 9 ref.

Descriptors: *Structural analysis, *Offshore platforms, *Floating, Ocean waves, Waves(Water), Model studies, Hydraulics, Structures, Engineering structures, *Dynamic response, Spectral analysis, Wave energy, Floating bodies.

Theoretical and experimental studies were conducted to investigate wave loadings on, and structural responses of, floating platforms. Strip theory was applied to calculate wave forces on the structure. The wave forces, the interaction between waves and the structure, and the resulting inertia forces then were applied to the structure, as external forces, to calculate member stresses. The structure was treated as a space frame for stress calculations. Typical characteristics of dynamic stresses resulting from wave loading were considered. A wave tank model test program was conducted to collect strain data. The model test program, measurements, and correlation of measured data with theoretical calculations were considered. Satisfactory agreement was found between theoretical stress calculation and measured data. (Lee-ISWS)
W78-08560

DIFFRACTION OF WAVES BY A WEDGE,
Case Western Reserve Univ., Cleveland, OH. Dept. of Earth Sciences.
W. Lick.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW2, Proceedings Paper 13715, p 119-133, May 1978. 6 fig, 13 ref, 2 append.

Descriptors: *Waves(Water), *Refraction(Waterwaves), *Model studies, Mathematical models, ocean waves, Coasts, Beaches, Breakwaters, Mathematics, Equations, Oceanography, *Diffraction(Water waves), Reflection, Wedges, Wave propagation.

The problem of wave propagation past a vertical wedge has been examined with the intent of generalizing previous solutions and finding useful asymptotic results. Reflection, diffraction, and the subsequent refraction of the incident, reflected, and diffracted waves were included in the analysis, and convenient asymptotic solutions were obtained. Significant effects due to reflection and diffraction were demonstrated and shown to be strongly dependent on wedge angle. The solutions obtained can be readily incorporated into present computer refraction programs so as to describe the propagation of waves past a wedge more generally than is presently possible. The geometrical theory of diffraction used here also can be applied to bodies of any shape so as to describe combined diffraction-refraction effects. (Sims-ISWS)
W78-08561

RUNUP OF IRREGULAR WAVES ON PLANE SMOOTH SLOPE,
Queen's Univ., Kingston (Ontario). Dept. of Civil Engineering.
J. W. Kamphuis, and N. Mohamed.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW2, Proceedings Paper 13716, p 135-146, May 1978. 8 fig, 4 tab, 15 ref, 2 append.

Descriptors: *Waves(Water), *Breakwaters, *Oceans, Model studies, Mathematical models, Laboratory tests, Flumes, Hydraulic models, Data processing, Analytical techniques, Oceanography, *Wave runup, Irregular waves, Wave spectra, Wave reflection, Wave period, Wave height, Breaking(Water waves), Spectral analysis.

Runup of irregular waves on smooth slopes of 1:3, 1:2, 1:1.5 and 1:1 was investigated. The waves were generated by superposition of component waves and simulated the spectra defined by Bretschneider and Scott. A few narrow frequency band spectra also were generated. Since the waves were nonbreaking for the most part, the reflection process affected the results and thus was investigated in detail. Subsequently runup distributions were related to wave height distributions, with special emphasis on average runup and 2% runup. A number of secondary observations with respect to superelevation of mean water level, spectrum bandwidth, runup period, and position of the leading edge of the runup also were made. (Sims-ISWS)
W78-08562

WASTEWATER DISPOSAL FROM TWO-DIMENSIONAL DIFFUSER,
Democritos Univ. of Thraki, Xanthi (Greece). School of Engineering.
For primary bibliographic entry see Field 5E.
W78-08567

RIVER TRANSPORT MODELING FOR UNSTEADY FLOWS,
Sutron Corp., Arlington, VA.
For primary bibliographic entry see Field 2E.
W78-08569

UNDERGROUND DRAINAGE PIPE,
For primary bibliographic entry see Field 4A.
W78-08600

VALIDATION OF USE OF DYE-DILUTION METHOD FOR FLOW MEASUREMENT IN LARGE OPEN AND CLOSED CHANNEL FLOWS,
Peerless Pump, Montebello, CA.
W. H. Morgan, D. Kempf, and R. E. Phillips.
In: NBS Special Publication 484, Proceedings of the Symposium on Flow Measurement in Open Channels and Closed Conduits, Gaithersburg, Maryland, p. 361-394, February 23-25, 1977. 12 fig, 4 tab, 13 ref, 1 append.

Descriptors: *Flow measurement, Water measurement, *Open channel flow, *Pipe flow, Pipelines, Tracers, Flumes, Calibrations, Instrumentation, *Dye dispersion.

The use of water soluble tracers for determining flow rates of rivers and streams has been practiced for several decades, both in the United States and abroad. During the last 15 years the economical availability of water soluble dyes, coupled with the considerable technical improvement in fluorometry equipment, has made feasible the use of dye-dilution methods for in situ calibration of flumes and other flow measurement devices. (Skogerboe-Colorado State)
W78-08701

THE DESIGN OF OPEN CHANNEL ACOUSTIC FLOWMETERS FOR SPECIFIED ACCURACY: SOURCES OF ERROR AND CALIBRATION TEST RESULTS,
Ocean Research Equipment, Inc., Falmouth, MA. Accusonic Div.
F. C. Lowell, Jr.
In: NBS Special Publication 484, Proceedings of the Symposium on Flow Measurements in Open Channels and Closed Conduits, Gaithersburg, Maryland, p. 243-266, February 23-25, 1977. 16 fig, 6 ref.

Descriptors: *Flow measurement, Water measurement, Velocity, Flow rate, *Open channel flow, *Flow meters(Acoustic), *Calibration, Instrumentation, *Design flow.

The design of open channel acoustic flowmeters is more difficult than the design of pipeline flowmeters because of errors introduced by the free surface, as well as because the open channel environment is usually more susceptible to attenuation and multipath conditions which can inject large errors unless special signal recognition and filtering techniques are employed. The sources of error in open channel acoustic flowmeters are tabulated and discussed. (Skogerboe-Colorado State)
W78-08702

NUMERICAL MODELING OF TWO-DIMENSIONAL FLUMES,
National Bureau of Standards, Washington, DC. Mechanics Div.
R. W. Davis.
In: NBS Special Publication 484, Proceedings of the Symposium on Flow Measurement in Open Channels and Closed Conduits, Gaithersburg, Maryland, p. 219-242, February 23-25, 1977. 12 fig, 2 tab, 10 ref.

Descriptors: Water measurement, *Flow measurement, *Flumes, *Open channel flow, Hydraulics, *Model studies, Weirs.

Flumes are commonly used devices for the measurement of open-channel flow rates. Their range of operation has been limited, however, because, outside of experimentally calibrating each configuration used, one has had to resort to one-dimensional theory for flow rate determination. This theory is restricted to fairly low values of upstream-head to crest-length ratio, as well as to almost level flumes with a reasonably uniform incoming velocity profile and nonconverging sidewalls. The present study is concerned with extending the operational range of a particular type of flume (the two-dimensional version of the Palmer-Bowlus flume) into areas where one-dimensional theory loses its validity. The determination of the head-discharge relationship for this flume is done numerically by use of the SOLA finite difference routine for two-dimensional free-surface flows. Effects of changes in flume geometry, channel slope, and upstream velocity profile are investigated. The numerical results are verified experimentally. (Skogerboe-Colorado State)
W78-08703

INSTRUMENT ERRORS IN OPEN CHANNEL FLOW MEASUREMENT SYSTEMS,
Instrumentation Specialties Co., Lincoln, NE.
D. M. Grant.
In: NBS Special Publication 484, Proceedings of the Symposium on Flow Measurement in Open Channels and Closed Conduits, Gaithersburg, Maryland, p 91-103, February 23-25, 1977. 9 ref.

Descriptors: *Flow measurement, Open channels, *Open channel flow, *Instrument errors, *Instrumentation, Flow meters.

Certain aspects of open channel flow measurement systems are briefly discussed, including primary and secondary measuring devices. The two functions of a secondary measuring device (open channel flow meter) are discussed: level measurement and level-to-flow rate conversion. Some of the common methodologies used to accomplish each of the two functions of a secondary device are described, and the possible sources and magnitudes of errors associated with each of these methodologies are analyzed. Level measurement methods discussed are: float, electxrical, ultrasonic, bubbler, and dipping probe. Level-to-flow rate conversion methods discussed are: mechanical cam, electronic analog function generator, electronic memory device, and opto-electronic function generator. In the interest of promoting a uniformity of specifications, a standard general format for open channel flow meters is proposed. (Skogerboe-Colorado State)
W78-08704

COMPENSATING FOR CONSTRUCTION ERRORS IN CRITICAL-FLOW FLUMES AND BROAD-CRESTED WEIRS,
Agricultural Research Service, Phoenix, AZ. Water Conservation Lab.
J. A. Replogle.
In: NBS Special Publication 484, Proceedings of the Symposium on Flow Measurement in Open Channels and Closed Conduits, Gaithersburg, Maryland, p 201-218, February 23-25, 1977. 5 fig, 1 tab, 8 ref.

Descriptors: *Flow measurement, *Flumes, *Weirs, *Open channel flow, Water measurement, Instrumentation, Errors.

Critical-flow flumes and braod-crested weirs can now be routinely and accurately calibrated (plus or minus 2%) by computer techiques over a wide range of flow rates and flume cross sections, including trapezoidal and complex shapes. This ability permits detailed compensation for errors introduced by construction anomalies. Procedures were developed and used on a series of primary devices in irrigation canals, including trapezoidal flumes and broad-crested weirs, which identified construction errors and accurately related a readout mechanism to the primary device, as constructed, so that the original intended accuracy could be restored. (Skogerboe-Colorado State)
W78-08705

ERRORS IN FLOW MEASUREMENT AND THEIR IMPORTANCE IN INFILTRATION/INFLOW ANALYSIS,
Environmental Quality Systems, Inc., Rockville, MD.
D. L. Guthrie, D. R. Washington, and C. Vincenty.
In: NBS Special Publication 484, Proceedings of the Symposium on Flow Measurement in Open Channels and Closed Conduits, Gaithersburg, Maryland, p. 173-200, February 23-25, 1977. 7 fig, 2 tab, 10 ref.

Descriptors: *Flow measurement, *Infiltration, *Weirs, *Flumes, Water measurement, Seepage, Errors, *Parshall flume, *Scow, *Instrumentation.

Several common flow-measurement devices including the weir, Parshall flume, and scow were used in field studies of infiltration/inflow in Puerto Rico. Mathematical determinations of infiltration/inflow were made by calculating the hydraulic gradient, the height of water in the sewer, and the velocity head loss. Both of these instrumental and physical-mathematical methods for flow determination are reviewed, stressing the advantages and disadvantages of each, their sources of error, and methods used to resolve that error, wherever possible. (Skogerboe-Colorado State)
W78-08706

DESIGN OF DRIP IRRIGATION LINES WITH VARYING PIPE SIZES,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
I. P. Wu, and H. M. Gitlin.
ASCE Journal of the Irrigation and Drainage Division, Vol. 103, No. IR4, p 499-503, December, 1977. 2 fig, 5 ref, 1 append.

Descriptors: *Irrigation design, Irrigation efficiency, Hydraulics, Irrigation methods, Hydraulic design, *Design, Irrigation engineering, Pipes, *Pipe sizes.

Most drip irrigation laterals and submains are designed for a single pipe size. The energy gradient line for a lateral with a single size has been derived and presented by an exponential curve that is used as basis for designing laterals or submains of drip irrigation systems on level fields or on slopes. However, under certain field conditions, the length of laterals and submains may be relatively long and have nonuniform slopes. The lateral and submain design may use a series of different pipe sizes. A design technique is presented. The purpose of this paper is to show that by designing laterals or submains with different pipe sizes (different diameters) the energy gradient line will be close to the slope of the lateral or submain; therefore, the pressure variation will be reduced. (Skogerboe-Colorado State)
W78-08719

LOW-PRESSURE SEWAGE SYSTEM FOR BUILDINGS--USES LARGE VENTILATED BACK-PRESSURE TANK, TO PREVENT FLOODING.
For primary bibliographic entry see Field 8C.
W78-08761

8C. Hydraulic Machinery

SYSTEM OF SLIGHTLY IMMERSED GATES,
Technion - Israel Inst. of Tech., Haifa. Hydrodynamics and Hydraulic Engineering Lab.
J. Mevorach, and K. Zanker.
Journal of Hydraulic Research, Vol 16, No 1, p 45-54, 1978. 5 fig, 10 ref.

Descriptors: *Gates, *Submergence, *Hydraulics, *Laboratory tests, Methodology, Control structures, Theoretical analysis, Energy loss, Froude number, *Self-regulating system, Contraction coefficient, Multi-gate systems.

A simple method was developed for solution of multi-gate systems often used in hydraulic engineering. While the problem cannot be analyzed rigorously, the solution was based on a simplified theoretical approach of divided flow and experimental evidence obtained from laboratory study. In order to dispense with laborious iterative computations, a working diagram was developed which enables speedy and simple solution of engineering problems. A few numerical examples were worked out and checked in the model, with remarkably good agreement. Related engineering aspects associated with multi-gate systems were reviewed, briefly, particularly the spacing of gates, which is of major improtance as far as hydraulic efficiency and prevention of wave amplification are concerned. (Singh-ISWS)
W78-08295

MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM; HYDROELECTRIC POWER GENERATION.
Institute for Water Resources (Army), Fort Belvoir, VA.
IWR Research Report 77-R4, December 1977. 110 p, 11 fig, 13 tab, 2 plates.

Descriptors: *McClellan-Kerr River Project, *River systems, *Hydroelectric power, *Marketing, *Cost allocation, *Powerplants, Investment, Navigation, Financing, Costs, Benefits, Federal government, Dams, Effects, Fuels, Reservoirs, Operations, Projects, Estimating.

An analysis of the hydroelectric generating facilities in the McClellan-Kerr River Project is presented. Installed capacity of the federal installations total 639 megawatts. Economic and financial questions of production and marketing are examined--the power is sold by a federal agency, the Southwestern Power Administration (SPA). Due to the rising cost of other fuels, the power benefits are expected to rise from a project justification estimate of $14 million. However, benefits are not as high as possible, due primarily to poor marketing practices by the SPA. There are also several problems in the cost allocation formula used to rate the on-going return on investment to the Federal Government for each dam taken individually. A supplemental report is appended which presents the results of the method now used by the Southwestern Division to keep running accounts for each power project, to check its financial progress toward meeting the requirement of Section 5 of the Flood Control Act of 1944 that costs allocated to power be recovered in a reasonable period of time; considered also are other accounting procedures. (Bell-Cornell)
W78-08425

EXPERIMENTAL STUDY OF DISCHARGE SIPHONS OF PUMPS IN THE PROJECT OF THE URBAN SEWER SYSTEM OF MONTREAL (ETUDE EXPERIMENTALE DES SIPHONS DE DECHARGE DES POMPES DANS LE CADRE DU PROJET D'ASSAINISSEMENT DE LA COMMUNAUTE URBAINE DE MONTREAL),
Service d'Assainissement des Eaux, Montreal (Quebec).
C. Mitci.
Tribune du CEBEDEAU, Vol 31, No 410, p 41-52, January, 1978. 13 fig, 5 tab, 6 ref.

Descriptors: *Pumping plants, *Siphons, *Sewerage, *Hydraulic structures, *Costs, Conveyance structures, Pipes, Flow rates, Design criteria, Equipment, Pumping, Municipal wastes, Waste water treatment.

Experiments were used to test two different discharge siphon designs for a pumping system planned to deliver municipal wastes and surface runoff from two interceptors in the Montreal sewer system to a sewage treatment plant. Parameters used to compare design performance included: charge loss, flow conditions in the siphon, and flow conditions in the sewer (water level, sediment transport, and pressure). Hydraulic characteristics and costs for operating pumping stations were also compared. Tests had disclosed that the presence of a stationary air pocket in the siphon of a variable speed pump necessitated the use of a vacuum pump not required under constant speed operation. For both constant and variable speed pumping, the siphon required a vent and a valve to prevent intake of air during priming; addition of a certain volume of air was necessary to unprime the siphon when pumping stopped. (Korha-FIRL)
W78-08434

MAINTAINING DIGESTER BALANCE MAKES FOR ENERGY CONSERVATION.
For primary bibliographic entry see Field 5D.
W78-08437

PERFORMANCE OF CIRCULAR FINAL CLARIFIERS AT AN ACTIVATED SLUDGE PLANT,
Metropolitan Sanitary District of Greater Chicago, IL.
For primary bibliographic entry see Field 5D.
W78-08438

LOW-PRESSURE SEWAGE SYSTEM FOR BUILDINGS--USES LARGE VENTILATED BACK-PRESSURE TANK, TO PREVENT FLOODING.
German Patent DS 2653-713. Issued March 2, 1978. Derwent German Patents Abstracts, Vol. A, No. 10, p 8, April, 1978. 1 fig.

Descriptors: *Conduits, *Sewers, *Storage tanks, *Patents, *Waste storage, Deisgn data, Domestic wastes, Pressure conduits, Sewerage, Waste water disposal, Municipal wastes.

A patent has been issued for a ventilated back-pressure tank system connected to a low-pressure sewage system designed for individual buildings. Waste water from the fixtures within the buildings flows through gravity pipes to a collection tank which adjoins a low-pressure sewage conduit. When the waste water level in the tank reaches a maximum, a blocking valve automatically opens to release the effluent into the sewage conduit. A back-pressure tank, located below the building fixtures and above the maximum level of the collection tank, is connected by a conduit to the gravity pipe from the building. The back-pressure tank has an open blocking element at its base where the conduit enters for ventilation from the surface to prevent flooding. (Lisk-FIRL)
W78-08761

COMBINATION TANKER FOR SEWER JETTING AND GULLY EMPTYING.
Surveyor, Vol. 151, No. 4469, p 22, February, 1978.

Descriptors: *Sewers, *Jets, *Pumps, *Scaling, *High pressure, Pressure head, Sludge disposal, Oily water, Pressure, Water pressure, Pipelines, Turbines, Cleaning, Waste water treatment, Municipal wastes.

Whale Tankers Ltd., Solihull, West Midlands, England, has manufactured a 2,600 gal tanker truck for municipal and industrial sewer jetting, washing, and gully emptying. The tank is divided into three compartments: the front for carrying clean water, the center for oily sludges, and the third for sludge and the gully arm. An air-cooled exhauster with a capacity of 60 cu ft/min is used to clear the tanks. A volume up to 75 gal/min is delivered by the high pressure piston pump at a pressure output of at least 700 bars. The tanker is used for sewer jetting and descaling in sewers up to 6 ft in diameter. The high pressure system is also capable of powering turbine rock-cutting heads for clearing blocked or collapsed sewers. (Lisk-FIRL)
W78-08771

8D. Soil Mechanics

GROUND WATER MANUAL, A GUIDE FOR THE INVESTIGATION, DEVELOPMENT, AND MANAGEMENT OF GROUND-WATER RESOURCES.
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 2F.
W78-08542

8E. Rock Mechanics and Geology

THE STORY OF A DAM,
For primary bibliographic entry see Field 6E.
W78-08351

8F. Concrete

INTERCEPTOR NORTH COMPLETED AHEAD OF SCHEDULE.
Water and Pollution Control, Vol. 116, No. 1, p 17, January, 1978.

Descriptors: *Interceptor sewers, *Tunnel construction, *Conveyance structures, *Concrete construction, *Sewerage, Construction materials, Rock excavation, Explosives, Shafts(Excavations), Waste water treatment, Municipal wastes.

A 25,000 ft portion of the 5-mile sewer interceptor for Montreal, Canada, has been completed by the contractor, Beaver Foundations Ltd., 6 mons ahead of schedule and about $3 million under the original bid. Completion of the 90 city block stretch of sewer is expected by 1980. The tunnel was constructed 100 ft below the surface through four shafts sunk along the 25,000 ft length. Rock blasting was required and the tunnel was excavated from each shaft in the direction of the neighboring shaft. The 16-ft diameter horseshoe-shaped tunnel will intercept all municipal wastes from collector sewers and transport the sewage to a proposed treatment facility at the eastern tip of Montreal Island. The tunnel, which will circle Montreal Island, required 128,000 cu yds of concrete for the initial 25,000 section. (Lisk-FIRL)
W78-08770

8G. Materials

STATE WATER CONSERVATION PROJECTS.
Montana Dept. of Natural Resources and Conservation, Helena. Engineering Bureau.
For primary bibliographic entry see Field 6E.
W78-08235

BROMINE CHLORIDE - AN ALTERNATIVE TO CHLORINE FOR FOULING CONTROL IN CONDENSER COOLING SYSTEMS,
Martin Marietta Corp., Baltimore, MD. Environmental Technology Center.
For primary bibliographic entry see Field 5G.
W78-08247

GROUND WATER MANUAL, A GUIDE FOR THE INVESTIGATION, DEVELOPMENT, AND MANAGEMENT OF GROUND-WATER RESOURCES.
Bureau of Reclamation, Washington, D.C.
For primary bibliographic entry see Field 2F.
W78-08542

PROCESS FOR CHELATING AND INHIBITING SCALE IN AQUEOUS SYSTEMS,
Petrolite Corp., St. Louis, MO. (Assignee).
For primary bibliographic entry see Field 5F.
W78-08589

METHOD OF LINING A WATERWAY OR RESERVOIR,
For primary bibliographic entry see Field 4A.
W78-08599

DETERIORATING SEWER LINE RE-LINED IN ARIZONA.
Water and Wastes Engineering, Vol. 15, No. 2, p 27, February, 1978.

Descriptors: *Linings, *Pipelines, *Plastic pipes, *Clay pipes, *Sands, Sewerage, Corrosion control, Joints(Connections), Infiltration, Saturated soils, Conveyance structures, Waste water disposal, Municipal wastes.

A clay tile sewer pipeline in Holbrook, Arizona, transporting municipal wastes to a treatment plant was relined with Phillips Products Co., Inc., 18-inch diam plastic pipe. The highly saturated clay and sandy soil beneath the 21-inch clay tile sewer connector had caused the pipe to sink. Initial attempts to stabilize the pipe bed with 5-ft of rock and concrete encasement were unsuccessful due to the high saturation of the former swamp drainage field. The 21-inch pipe was relined with 18-inch plastic pipe in 38-ft sections. The corrosion-resistant pipe lengths were butt fused and inserted into the existing sewer line. The joints prevent infiltration and exfiltration; the plastic pipe is resistant to mineral accumulation and retains its properties. The 710 ft plastic pipe was assembled in two sections, 298 and 412 ft long, which were emplaced by a Caterpiller loader. The entire relining project was completed in two days by M. M. Sundt Construction. (Lisk-FIRL)
W78-08766

8I. Fisheries Engineering

ANGLED SCREENS AND LOUVERS FOR DIVERTING FISH AT POWER PLANTS,
Stone and Webster Engineering Corp., Boston, MA.
E. P. Taft, III, and Y. G. Mussalli.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 104, No HY5, Proceedings Paper 13731, p 623-634, May 1978. 5 fig, 2 tab, 11 ref, 1 append.

Descriptors: *Fish handling facilities, *Intakes structures, *Powerplants, *Lake Ontario, Laboratory tests, Fish, Fish conservation, Fish passages, Fish guiding, Cooling water, Structures, Hydraulic structures, Environmental engineering, Fish screens, Angled screens, Louvers.

Angled screens and louvers have been evaluated experimentally and developed for diverting fish to bypass within cooling water intake structures. Louvers have been shown to be greater than 90% effective in diverting a variety of fish species in both laboratory and prototype studies. Recent studies with angled traveling screens have shown them to be 100% effective in guiding fish to bypasses. Angled screen and fish transportation systems are presently under construction at two large power plants on Lake Ontario. (Sims-ISWS)
W78-08271

MATHEMATICAL METHODS TO EVALUATE ENTRAINMENT OF AQUATIC ORGANISMS BY POWER PLANTS,
National Power Plant Team, Ann Arbor, MI.
C. P. Goodyear.
Biological Services Program Report FWS/OBS-76/20.3, Fish and Wildlife Service, U.S. Department of the Interior, September 1977. 17 p, 3 ref, 2 append.

Descriptors: *Aquatic organisms, *Entrainment, *Equations, *Rivers, *Streams, *Lakes, *Reservoirs, *Estuaries, Estimating, Powerplants, Population loss, Water quality, Effects.

Equations are presented which may be used to estimate the percentage loss of populations of aquatic organisms that are entrained by power plants located on rivers and streams, lakes and reservoirs, and estuaries. Important parameters that must be estimated to employ the techniques include the average concentration of organisms in the intake water and in the water body, mortality of entrained organisms, and the average period organisms are vulnerable to entrainment. (See also W78-05260) (Graf-Cornell)
W78-08312

WATER INTAKE AND FISH CONTROL SYSTEM, W78-08648
Southern California Edison Co., Rosemead. (Assignee).
D. I. Downs, L. E. Larson, and V. J. Schuler.
U.S. Patent No. 4,064,048, 12 p, 10 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 965, no 3, p 1051, December 20, 1977.

Descriptors: *Patents, *Fish handling facilities, *Fish barriers, *Engineering structures, Fish guiding, Cooling water, Intakes, Screens.

The object of this invention is to provide a water intake system which would satisfactorily remove trash and debris while at the same time avoid injury to the fish drawn into the intake watercourse. An important consideration which must be satisfied is that the primary function of the screening system must be maintained. That is, the screenwell design must provide clean water to the circulating pumps for condenser cooling by means of an effective trash removal system which has minimum hydraulic losses. Intake water flows from the body of water through the intake structure, through the water-course and through debris removing screens. A fish diversion structure is mounted across the water-course for diverting fish from the screens through which the main flow of water passes and fish removal means are located at one end of the fish diversion structure for removing the diverted fish to a holding chamber for return to the body of water. The fish diversion structure includes a continuous flush face across the front extending towards the fish removal means at an angle of about 30 degrees or less, with respect to the direction of flow. The flush face of the structure is generally defined by the upstream face of support piers and the upstream or front face of each assembly of adjacent and vertically traveling rectangular frames positioned between the piers. Each frame includes vertically extending and laterally spaced louver bars mounted perpendicular to the plane of the flush face of the structure. (Sinha-OEIS)
W78-08591

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

WATER QUALITY INDICES: A SURVEY OF INDICES USED IN THE UNITED STATES,
Environmental Protection Agency, Washington, DC. Office of Monitoring and Technical Support.
For primary bibliographic entry see Field 5A.
W78-08265

TRANSFORMATIONS OF HEAVY METALS AND PLANT NUTRIENTS IN DREDGED SEDIMENTS AS AFFECTED BY OXIDATION REDUCTION POTENTIAL AND PH, VOLUME I: LITERATURE REVIEW,
Louisiana Agricultural Experiment Station, Baton Rouge.
For primary bibliographic entry see Field 5C.
W78-08381

THE PROVISION OF TECHNICAL INFORMATION IN A REGIONAL WATER AUTHORITY,
Severn-Trent Water Authority, Birmingham (England).
For primary bibliographic entry see Field 05G.
W78-08502

POTENTIAL EFFECTS ON AQUATIC RESOURCES OF PROCESSING AND/OR CONVERSION OF IOWA COAL,
Iowa Cooperative Fishery Research Unit, Ames.
For primary bibliographic entry see Field 05C.

CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey.

- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.

- Eastern United States water law at the College of Law of the University of Florida.

- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.

- Water resources economics at the Water Resources Center of the University of Wisconsin.

- Eutrophication at the Water Resources Center of the University of Wisconsin.

- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.

- Water well construction technology at the National Water Well Association.

- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.

- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.

- Agricultural livestock waste at East Central State College, Oklahoma.

- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

7 RESOURCES DATA

8 ENGINEERING WORKS

9 MANPOWER, GRANTS, AND FACILITIES

10 SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

SUBJECT INDEX

AUTHOR INDEX

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